

THURSDAY, APRIL 5, 2018
ACADEMIC AFFAIRS AND STUDENT LIFE COMMITTEE MEETING

Clark C. Kellogg
Cheryl L. Krueger
Janet B. Reid
Timothy P. Smucker
Erin P. Hoeflinger
Abigail S. Wexner
Hiroyuki Fujita
Alan A. Stockmeister
H. Jordan Moseley
James D. Klingbeil
Janet Porter
Richard K. Herrmann
Alex Shumate (*ex officio*)

Location: Longaberger Alumni House
Sanders Grand Lounge

Time: 12:15-2:00pm

ITEMS FOR DISCUSSION

1. *Theory to Practice: How Student Life and the College of Education & Human Ecology Advance their Field through Learning and Experience* - Dr. Adams-Gaston, Dr. Jones, Mr. Bryson 12:15-12:35pm
2. *Teaching and Learning: Improving Student Outcomes through Exemplary Practices Across Campuses (verbal)* - Dr. McPheron 12:35-12:45pm
3. *Teaching Exemplar* - Dr. DeWitt 12:45-12:55pm

ITEMS FOR ACTION

4. Revision of Patents and Copyrights Policy - Dr. McPheron 12:55-1:00pm
5. Amendments to the *Rules of the University Faculty* - Dr. McPheron 1:00-1:05pm
6. Faculty Personnel Actions - Dr. McPheron 1:05-1:10pm
7. Degrees and Certificates - Dr. McPheron 1:10-1:15pm
8. Honorary Degrees - Dr. McPheron 1:15-1:20pm
9. Revocation of an Honorary Degree - Dr. McPheron 1:20-1:25pm
10. Establishment of New Degree Programs - Dr. McPheron 1:25-1:30pm

Executive Session

1:30-2:00pm



From Theory to Practice: How the Office of Student Life and the College of Education and Human Ecology Facilitate Hands-on Learning through the Student Personnel Assistantship Program

A Brief History of Higher Education and Student Affairs

The professional and scholarly field of Higher Education and Student Affairs (HESA) is based on more than 100 years of scholarship and is centered on concepts of Student Development Theory, the holistic development and growth of individuals pursuing post-secondary education. The field of HESA traces its roots to colleges' and universities' Deans of Women and Deans of Men in the late 19th and early 20th centuries.

As psychology emerged as a field of study in the 1920s, student "personnel" offices began taking a psychosocial point of view to help students navigate large universities. This shift laid the groundwork for considering students' holistic experience in college. After the Serviceman's Readjustment Act of 1944, known as the GI Bill, and the massive expansion of higher education in the United States from the mid-1940s to mid-1970s, colleges experienced greater demands for student services, both in and outside of the classroom. The work of student affairs professionals increased in scope to encompass a broader focus on the student experience, from Residence Life to Greek Life, student activities and career planning and placement.

In the mid-1970s, publications by the Council of Student Personnel Associations in Higher Education established the guiding principles of the field of student affairs, solidifying student development theories as central to the field (Brown, 1972; Cooper, 1975). Fundamental to these principles is the idea that HESA professionals must value students, treat students with dignity and work to develop the whole student.

In 1994, the *Student Learning Imperative* was published, emphasizing the importance of student learning in the co-curricular setting and the role of student affairs professionals as educators (ACPA, 1994). Following this publication has been two decades of robust academic research and scholarship on student learning, bolstering the knowledge of the field.

Today, the field of student affairs continues to grow and evolve, with more than 20,000 members belonging to the two national professional student affairs associations, ACPA – College Educators International and NASPA – Student Affairs Administrators in Higher Education. Professionals in the field continue their focus on student learning, as well as preparing a professional workforce that can meet the evolving needs of a changing student population.

Ohio State is home to one of the longest-standing Student Life divisions in the nation and Ohio State's College of Education and Human Ecology has graduated distinguished scholars, presidents, provosts, deans and other leaders in higher education, the government, non-profit organizations and even the private sector. Vital to both groups' success is a partnership that prepares graduate students to become successful practitioners through opportunities to put theories learned in the classroom into practice through the Student Personnel Assistantship program (SPA).

This brief history is adapted from Schwartz and Stewart's "The History of Student Affairs" published in *Student Services: A Handbook for the Profession* (2017).





By the Numbers

4 – years in a row Ohio State’s Office of Student Life has been named one of the Most Promising Places to Work in Student Affairs by *Diverse: Issues in Higher Education* and ACPA – College Educators International

8 – professional development workshops offered each year through the Office of Student Life GradPad, covering targeted topics such as navigating professional conferences, salary negotiations and writing resumes

65 – years the HESA and Student Personnel Assistantship Program has existed at Ohio State, preparing leaders to contribute to the field

75 – approximate number of Graduate Administrative Assistantships provided annually by the Office of Student Life

References

ACPA. (1996). *The student learning imperative*. Washington, D.C: Author.

Brown, R. D. (1972). *Student development in tomorrow’s higher education*. Washington, D.C: American Personnel and Guidance Association.

Cooper, A.C. (1975). Student development services in post-secondary education. *Journal of College Student Personnel* 16(6), 524-28.

Schwartz, R. A., & Stewart, D.-L. (2017). The history of student affairs. In J. H. Schuh, S. R. Jones, & V. Torres (Eds.), *Student services: A handbook for the profession* (6th ed.; pp. 20-38). San Francisco, CA: Jossey-Bass.



REVISION OF THE PATENTS AND COPYRIGHTS POLICY

Synopsis: Revision of the university's Patents and Copyrights policy (renamed Intellectual Property policy), is proposed.

WHEREAS The Ohio State University encourages the creation and dissemination of knowledge, including works of authorship, discoveries, inventions, patents and tangible property that can serve the public through open academic exchange and commercial development; and

WHEREAS The Ohio State University Board of Trustees previously adopted the Patents and Copyrights policy in May 1985, to create a process to oversee such efforts; and

WHEREAS the Patents and Copyrights policy was most recently revised, with approval by the Board of Trustees, in May 1989; and

WHEREAS there is now a desire to revise the Patents and Copyrights policy to clarify the rights of faculty members with respect to their scholarship, instructional works and artistic works; address the rights of software creators; update the process for the commercialization of inventions, discoveries and patents; address the rights of staff members with respect to their intellectual creation; adjust the royalties-sharing mechanism; establish a dispute resolution mechanism; align the policy with the university's standard policy template; and rename it the Intellectual Property policy; and

WHEREAS rule 3335-13-06 states that the University Senate's intellectual properties, patents and copyrights committee (IPPC) shall review and have the power to propose changes to the policy on intellectual property, patents and copyrights; and

WHEREAS rule 3335-13-06 also states that revisions to the policy must be approved by the Faculty Council and University Senate, in addition to the other approvals required by the university policy process; and

WHEREAS after a multi-year drafting process, the IPPC approved the proposed revised Patent and Copyrights policy (renamed Intellectual Property policy); and

WHEREAS the senior vice president for Business and Finance and chief financial officer reviewed the proposed revised policy and recommended such revisions to the Senior Management Council and the president's cabinet; and

WHEREAS the Senior Management Council endorsed, and the president's cabinet approved, the proposed revised policy; and

WHEREAS the Faculty Council and the University Senate approved the proposed revised policy; and

WHEREAS the University Senate and the president's cabinet recommend the adoption of the revised Patents and Copyrights policy (renamed Intellectual Property policy):

NOW THEREFORE

BE IT RESOLVED, That the Board of Trustees hereby approves the revised Patents and Copyrights policy (renamed Intellectual Property policy) as set forth in the attachment, proposed to be effective April 15, 2018.

BACKGROUND

TOPICS: Revision of the university's Patents and Copyrights policy, to be renamed the Intellectual Property policy.

CONTEXT: The university's Patents and Copyrights policy was issued in 1985, and most recently revised in 1989. Both the issuance and the revision were approved by the Board of Trustees. The board also previously adopted rule 3335-13-06, which empowers the University Senate's intellectual properties, patents and copyrights committee (IPPC) to propose changes to the existing policy. That committee — which includes members from multiple colleges, the Council of Graduate Students, the Technology Commercialization Office and the Office of Research — has been working for several years to revise the policy. The proposed revised policy has now been approved by, among others, the IPPC, the university's Faculty Council, Senior Management Council, president's cabinet and University Senate. The Board of Trustees' approval is the final step in the policy approval process.

SUMMARY: For several years, the IPPC has been reviewing the existing Patents and Copyrights policy along with related policies of benchmark institutions. The IPPC and other university stakeholders have come to the conclusion that the policy should be revised to better reflect the current intellectual property landscape, encourage the creation and dissemination of knowledge and promote the commercialization of intellectual property. Specifically, the proposed revised policy clarifies the rights of faculty members with respect to their scholarship, instructional works and artistic works; addresses the rights of software creators; updates the process for the commercialization of inventions, discoveries and patents; addresses the rights of staff members with respect to their intellectual creation; adjusts the royalties-sharing mechanism; establishes a dispute resolution mechanism; aligns the policy with the university's standard policy template; and renames it the Intellectual Property policy to better capture the breadth of the policy.

REQUESTED OF THE ACADEMIC AFFAIRS AND STUDENT LIFE COMMITTEE: Approval of the resolution.



Applies to: Faculty, staff, and students

Responsible Office

Office of Business and Finance

POLICY

Issued: 05/03/1985
Revised: 04/15/2018 (target date)

The university encourages **faculty**, staff, and students to engage in the creation and dissemination of knowledge, including works of authorship, discoveries, inventions, patents, and tangible property that can serve the public through open academic exchange and commercial development. The university is committed to creating a culture and infrastructure that nurtures these activities and highlights the capacity of its **faculty**, staff, and students to advance the well-being of the people of Ohio and the global community through the creation and dissemination of knowledge. The university recognizes the importance of intellectual freedom and autonomy of **faculty**, staff, and students.

Purpose of the Policy

To establish rules regarding the ownership, distribution, and commercialization of **intellectual property** created by university **faculty**, staff, and students.

Definitions

Term	Definition
Artistic works	Works created primarily for their cultural or aesthetic value. Such works may include, but are not limited to, plays, poems, novels, paintings, illustrations, sculptures, and musical compositions.
Copyrighted materials	Works protected by copyright that are authored by the university or its faculty , staff, and students, provided that copyrighted materials will not include inventions for the purpose of this policy.
Creator	A creator is a faculty member, staff member, or student who meets one or more of the following criteria: (a) With respect to copyrighted materials , creator means the author, as that term is defined under U.S. copyright law, provided that if the author is the university due to its position as the employer of the individual creator , then, for the purpose of this policy, the creator will be the individual who would have been considered the author if that individual was not performing the work within the scope of employment. (b) With respect to inventions that are eligible for patent protection, as well as know-how and any other inventions related to such inventions that are eligible for patent protection, creator means any inventor, as the term is construed under U.S. patent law. (c) With respect to tangible research property , creator means any individual who has taken part: (a) in the conception of the idea of the specific tangible research property that is to be made; and/or (b) substantially in making the tangible research property but only when making the tangible research property was not a routine or known practice. An individual will not be considered a creator of a new tangible research property solely because that individual provided materials to be used to produce the new tangible research property . (d) With respect to any other intellectual property that does not fall within the above criteria, creator means any individual who provided substantive and substantial intellectual contribution to the creation of the intellectual property .
Direct expenses	Costs, expenses, taxes, and losses paid or incurred by the university or on its behalf that are directly: (i) attributable to intellectual property being transferred, commercialized, or exploited; (ii) related to the commercialization, preservation, marketing, licensing, and legal protection of specific intellectual property ; or (iii) associated with acquiring, managing, transferring, or liquidating equity to be used for the transference, commercialization, or exploitation of specific intellectual property .
Faculty	Has the meaning set forth in Faculty Rules 3335-5-19 . Without limiting the foregoing, it includes those appointed by the board of trustees with tenure track, non-tenure-track (including clinical faculty, research faculty, and associated faculty), and emeritus faculty titles.
Gross proceeds	All cash received from the transfer, commercialization, or other exploitation of intellectual property including, but not limited to, royalties, option fees, license fees, reimbursement of expenses, and/or cash from dividends or distributions on, or the sale or liquidation of, equity. In the case of sponsored research , the cash or other consideration received by the university from the sponsor of such research to do the

Applies to: Faculty, staff, and students

	research, except for royalties for intellectual property , are not part of the gross proceeds . TAF proceeds are not part of the gross proceeds . Unless an agreement pursuant to section VI under Policy Details provides otherwise, the proceeds received from the commercialization of the intellectual property created in sponsored research , except for any TAF proceeds , are part of the gross proceeds .
Instructional works	Works created primarily for the instruction of students or for continuing education and certification programs. Such works may include, but are not limited to, slides and presentation content to be used in classes, class notes, exercises and assignments, syllabi, and examinations.
Intellectual property	All inventions and copyrighted materials .
Inventions	All rights to and interests in discoveries, inventions, and patents covered by Ohio Revised Code §3345.14(B) , as well as tangible research property .
Net proceeds	Gross proceeds less direct expenses .
OSIF	Ohio State Innovation Foundation. A 501(c)(3) organization, formed in 2013 by the university to manage intellectual property developed at or created by the university and to facilitate the commercialization of such intellectual property . The university may assign to OSIF university IP to be commercialized by OSIF. In return, OSIF will transfer, according to this policy, the net proceeds generated from the university IP so assigned to the Technology Commercialization Office (TCO), to distribute according to this policy. OSIF includes any successive entity to Ohio State Innovation Foundation.
Ohio State proceeds	The amount of net proceeds received by the university directly or as a distribution from OSIF .
Scholarly works	Works created primarily to express and preserve scholarship as evidence of academic advancement or academic accomplishment. Such works may include, but are not limited to, scholarly publications, journal articles, research bulletins, monographs, and books (including textbooks and electronic books).
Software	The source code and/or object code of computer applications and subroutine libraries. Software, for the purposes of this policy, does not include other works in the form of computer software including computer-generated works of art or music or the content of other forms of works, such as traditional scholarship, that is recorded in a software medium.
Sponsored research	Research projects that are supported by funding or other consideration (received by the university) provided in response to a request or proposal to a government or industrial sponsor or supported by specific deliverables in a grant from a funding entity, including research or other activity undertaken by the university or one of its units that is subject to specific written obligations to another party.
TAF proceeds	Any non-refundable, fixed upfront or fixed delayed fees (including related option fees), such as technology access fees, paid by a sponsor of sponsored research in addition to the research project funding that entitles the sponsor to rights in intellectual property arising under the university's performance of such sponsored research project.
TAF Researcher	Any university faculty , staff, or student involved in the performance of a research project for which TAF proceeds are received.
Tangible research property	Research results that are in a tangible form as distinct from intangible property. Examples of tangible property include, but are not limited to: cell lines; data; human, animal, and plant tissue; transgenic animals; antibodies; biological organisms; and integrated circuits. Tangible mediums of expression in which copyrighted materials are fixed, including, but not limited to, books, copies of articles, and music sheets are not tangible research property .
University IP	All intellectual property owned by the university as set forth in this policy.

Policy Details

- I. This policy is subject to all applicable laws including federal and Ohio law, and in particular Ohio Revised Code §3345.14. **Faculty**, staff, and students are bound by this policy by accepting or continuing university employment or by using university resources or facilities and promise to irrevocably assign, and hereby irrevocably assign, all rights, title, and interests in **university IP** to the university.
- II. With the exception of specific written agreements to the contrary (see section VI), and without limiting the general disclosure obligations (see section VII.C), nothing in this policy will be interpreted to prevent any **faculty**, staff, or students from sharing the results of their research and other academic activities with others, including by publishing those results. **Faculty**, staff, and students should however be aware that under certain circumstances disclosure can jeopardize the ability to secure a patent for an **invention** and they are therefore advised to consult with the Technology Commercialization Office (TCO) prior to such public disclosure.
- III. Ownership of **inventions**. Subject to the terms of section VI:
 - A. All rights, title, and interests in **inventions** are the sole property of the university. The university hereby assigns to the **creator(s)** every **invention**:



Applies to: Faculty, staff, and students

1. developed by **faculty** or staff acting outside of the scope of their employment provided that such **intellectual property** was developed with no more than insignificant use of university resources, or
 2. developed by a student, provided that the invention was not developed:
 - a. within the scope of employment of a student who is an employee;
 - b. as part of a **sponsored research** project; or
 - c. as part of a course or a university degree program for which the relevant syllabus, made reasonably available to the students before the **invention** was developed, provided that the student will not own such an **invention**.
- B. Every student hereby grants the university the following licenses:
1. a nonexclusive, perpetual, worldwide, royalty-free license to use any **inventions** created as part of a course or a university degree program for administrative purposes, such as assessment of a work, accreditation, and to prevent and/or remediate research or academic misconduct; and
 2. a nonexclusive, perpetual, worldwide, royalty-free license to any use of any **inventions** that the student owns that were developed by the student with more than insignificant use of university resources not as part of a course or a university degree program. The TCO, in consultation with the relevant principal investigator, may waive or limit that license if it concludes that the invention is not likely to harm future research at the university.
- C. As used in this section III, insignificant use of university resources includes, but is not limited to, de minimis use of: university networks and email systems; office spaces; libraries and their resources; desktops, laptops, cell phones, tablets, and **software** that is commonly installed thereon; servers; and cloud storage services. Insignificant use of university resources does not include the use of:
1. other university employees or students in developing, testing, or distributing the **inventions**; or
 2. university laboratories or equipment besides the equipment referenced above in this subsection III.C or similar commonly used items.
- IV. Ownership of **copyrighted materials**. Subject to the terms of section VI:
- A. All copyrights in **instructional works**, **scholarly works**, and **artistic works** whose **creators** are **faculty** members, except for **software**, remain with their **creators**. The university hereby assigns any of its copyrights in such works, insofar as they exist, to their **creators**. Such works will not be deemed **university IP** under this policy. The copyright in all other **copyrighted materials** whose **creators** are **faculty** members that are created within the scope of the **creators'** employment belong to the university.
 - B. The university hereby grants to every **faculty** member who is a **creator** of **software** that is not eligible for patent protection a perpetual, exclusive, worldwide, sublicensable, royalty-free license to use the **software** for any scholarly, instructional, and artistic purpose, as well as grants a perpetual, nonexclusive, worldwide, royalty-free license to allow others, for no consideration, to use the **software**, subject to terms and conditions determined by the **creator**. Without limiting the foregoing, the university may require **faculty** members to agree to limits on their rights under those licenses as a condition for commercialization of the **software**.
 - C. Each **creator** who is a **faculty** member grants the university the following licenses with respect to the **instructional works** created during employment at the university:
 1. If the **instructional works** were created with the intention to be used for teaching by others at the university, then the **creators** hereby grant the university a perpetual, nonexclusive, worldwide, royalty-free license to use the **instructional works** for any of the university's teaching and educational purposes as well as for administrative purposes such as accreditation.
 2. If the **instructional works** were not created with the intention to be used for teaching by others at the university, then the **creators** hereby grant the university a nonexclusive, worldwide, royalty-free license to use every such **instructional work** that was used for the instruction of the university's students. Such a license is limited to use for teaching in the same course or in a similar course to that for which they were developed as well as for administrative purposes such as accreditation. The license with respect to each such **instructional work** expires at the earliest of (i) that work reasonably and in good faith becoming available on the market or (ii) one year after the **creator** ceases to teach the course for which those **instructional works** were developed for the university.
 - D. Copyright of works whose **creators** are staff will be owned as followed:

Applies to: Faculty, staff, and students

1. Subject to the exceptions set forth below, **copyrighted materials** created by staff within the scope of their employment is owned by the university.
 2. The university acknowledges that a limited number of staff members have certain prerogatives to set their own research, scholarly, instructional, artistic, or creative tasks and in certain circumstances personal ownership of copyright arising from these professional endeavors would be appropriate. The TCO will establish reasonable procedures, which will be reviewed and approved by the Intellectual Property, Patents, and Copyrights Committee (IPPC), to allow unit heads and deans to submit an application to the TCO to request that the university assign copyright of specific works or classes of works to their staff-**creator**. TCO, in consultation with the relevant unit head or dean, may grant, deny, or modify such requests. TCO will report to IPPC from time to time, but at least once a year, about the type of requests that have been approved and have been denied under these procedures.
 3. Notwithstanding the foregoing, post-doctoral research employees will have the same rights and obligations in **copyrighted materials** they create in their capacity as post-doctoral research employees that **faculty** have.
 4. Notwithstanding the foregoing, students who are the instructors of record for a course and author **instructional works** developed for that course own those **instructional works** whether student-employees or not. Those students grant the university the same license that the university would have received under section IV.C above if the works were developed by a **faculty** member.
- E. Students retain copyrights in **copyrighted materials** that they author except that the university owns those materials when they are authored by student-employees within the scope of their employment. The university hereby assigns any of its copyrights in such works (excluding works created by a student-employee within the scope of employment), insofar as it exists, to their **creators**. Such works will not be deemed **university IP** under this policy. Every student hereby grants the university a perpetual, worldwide, nonexclusive, royalty-free license to use such **copyrighted materials** in any way for administrative purposes, such as assessment of the work, accreditation purpose, and to prevent and/or remediate research or academic misconduct. In addition, the university may require students to provide a single copy of their thesis or dissertation to the university for non-commercial library use.
- F. Rights in co-authored **copyrighted materials** will be determined in the following way. First, the co-authors will be identified, pursuant to applicable law. Then, the ownership rights of each co-author will be determined separately pursuant to Sections IV.A-IV.E, as if that co-author created the entire work. The owners identified in this process will be the joint owners of the work.
- V. Proceeds Distribution
- A. For **university IP** transferred to **OSIF** for which **OSIF** receives **gross proceeds**, **net proceeds** will be distributed as follows:
1. For **net proceeds** up to \$100,000, **OSIF** will distribute 50% of the **net proceeds** to TCO as **Ohio State proceeds** for distribution to **creators** pursuant to subsection V.B.1. **OSIF** will distribute a share of the remaining 50% of the **net proceeds** to units that have borne, in all or in part, the **direct expenses** in connection to the commercialization of **university IP** for which **OSIF** received the **gross proceeds** (if any), in proportion to the expenses borne by those units, and will retain the rest to cover its unreimbursed expenses.
 2. When **net proceeds** exceed \$100,000, the first \$100,000 will be distributed in accordance with subsection V.A.1, and any portion of the **net proceeds** beyond the first \$100,000 will be distributed as follows: 15% of these **net proceeds** will be retained by **OSIF** and 85% of these **net proceeds** will be distributed to TCO on behalf of the university as **Ohio State proceeds** pursuant to subsection V.B.2.
- B. **Ohio State proceeds** received as a distribution from **OSIF** will be distributed as follows:
1. For **Ohio State proceeds** up to \$50,000, the **creator(s)** will receive 100% of these **Ohio State proceeds**.
 2. When **Ohio State proceeds** received as a distribution from **OSIF** exceed \$50,000, the first \$50,000 will be distributed in accordance with subsection V.B.1. and any portion of the **Ohio State proceeds** beyond the initial \$50,000 will be distributed as follows:
 - a. 40% to the **creator(s)**;
 - b. 20% to TCO on behalf of the university; and

Applies to: Faculty, staff, and students

- c. 40% to the **creator(s)**' colleges, departments, and centers, according to instructions and guidelines established by the provost.
- C. **Ohio State proceeds** received by the university directly will be distributed as follows:
 1. For **Ohio State proceeds** up to \$100,000, the **creator(s)** will receive 50% of these **Ohio State proceeds**. TCO will distribute a share of the remaining 50% of the **Ohio State proceeds** to units that have borne, in all or in part, the **direct expenses** in connection to the commercialization of **university IP** for which the **Ohio State proceeds** were received (if any), in proportion to the expenses borne by those units, and will retain the rest on behalf of the university.
 2. Any portion of these **Ohio State proceeds** beyond the initial \$100,000 will be distributed as follows:
 - a. 34% to the **creator(s)**;
 - b. 33% to TCO on behalf of the university; and
 - c. 33% to the **creators'** colleges, departments, and centers, according to instructions and guidelines established by the provost.
- D. **TAF proceeds** will be distributed as follows:
 1. For **TAF proceeds** up to \$100,000, the **TAF researchers** will receive, in accordance with subsections V.D.3 and V.D.4, 50% of the **TAF proceeds**, and TCO on behalf of the university will receive 50% of the **TAF proceeds**.
 2. Any portion of the **TAF proceeds** beyond the initial \$100,000 will be distributed as follows:
 - a. 34% to the **TAF researchers**, in accordance with subsections V.D.3 and V.D.4;
 - b. 33% to TCO on behalf of the university; and
 - c. 33% to the **TAF researchers'** colleges, departments, and centers, according to instructions and guidelines established by the provost.
 3. The principal investigator(s) of the research project for which **TAF proceeds** are to be received or that were received will propose to the Office of Research a distribution plan for the **TAF researchers'** share of these proceeds. Such a distribution plan should be created at the commencement of the research project and communicated to the **TAF researchers** who are identified by it. The distribution plan may include details such as what portion of the **TAF researchers'** share each **TAF researcher** will be granted, if any; when distributions to the **TAF researchers** will be made; and whether the portions may or may not be adjusted according to actual contribution of the **TAF researchers**. The distribution plan must be approved by the Office of Research, which may develop, in consultation with the IPPC and TCO, guidelines for the review and approval of such distribution plans.
 4. The **TAF researchers'** share will be distributed only after a distribution plan, pursuant to subsection V.D.3, is approved by the Office of Research and according to the approved plan. If no such distribution plan is approved before the completion of the research project, the **TAF researchers'** share will be distributed according to the Office of Research guidelines among **TAF researchers** who provided substantive and substantial intellectual contribution to the research project as determined by the Office of Research, in consultation with TCO, unless all those **TAF researchers** agree in writing to a different distribution.
- E. When **university IP** has more than one **creator**, the **creators** will equally share the **creators'** share under subsections V.B and V.C, as applicable, unless all the **creators** agree in writing to a different distribution of the **creators'** share. Further, a subset of the **creators** can agree in writing among themselves to have a different distribution of their own share.
- F. When multiple **intellectual property** assets are licensed or otherwise commercialized under a single agreement, TCO, after consulting with the **creator(s)**, will reasonably determine and designate the share of **Ohio State proceeds** to each **intellectual property** asset.
- G. When there are no identifiable **creators** of **tangible research property**, the portion of the **Ohio State proceeds** distributable under subsections V.B and V.C to **creators** will be distributed instead to the colleges, departments, and centers that obtained the **tangible research property**, according to guidelines established, in consultation with the IPPC and TCO, by the Office of Research. When multiple colleges, departments, and/or centers are involved in obtaining the **tangible research property**, the **Ohio State proceeds** will be

Applies to: Faculty, staff, and students

divided equally among these units, unless otherwise specified by the guidelines established by the Office of Research.

- H. Notwithstanding the other provisions in this policy, for licensed plant varieties, proceeds will be distributed pursuant to [Special Circular 178-01](#) entitled “OSU-OARDC Plant Germplasm Release Guidelines and Practices.”
- I. **Creators** and **TAF researchers** will be entitled to receive a share of the **Ohio State proceeds** and **TAF proceeds** as provided by this policy even if their status with the university changes, including, for example, after their employment or program of study was terminated or completed. Following a change in the university Intellectual Property policy, **creators** will be entitled to receive, with respect to any distribution made after such a change, the greater of (i) the share of the **net proceeds** as provided by the university policy in effect at the time the **intellectual property** was disclosed or (ii) the share of the **net proceeds** as provided by the university policy in effect at the time the distribution is made. Following a change in the university Intellectual Property policy, **TAF researchers** will be entitled to receive, with respect to any distribution made after such a change, the greater of (i) the share of the **TAF proceeds** as provided by the university policy in effect at the time the research project for which the **TAF Proceeds** were received commenced or (ii) the share of the **TAF proceeds** as provided by the university policy in effect at the time the distribution is made. For the avoidance of doubt, **creators** and **TAF researchers** will not be entitled to receive any additional distribution or any other compensation with respect to distributions that were made prior to such a change in the policy.
- J. Nothing in this policy is intended to limit the transferability of rights of **creators** or **TAF researchers** to their heirs and assigns. Without limiting the foregoing, the distribution of proceeds to **creators** and **TAF researchers** under this section V will be made to **creators** and **TAF researchers**, their heirs and assigns, as applicable.
- K. This policy will not change the ownership or any other right with respect to **intellectual property** that was created before its effective date. However, any **Ohio State proceeds** or **TAF Proceeds** received after the effective date of this policy will be distributed according to this policy, whether the **intellectual property** was developed before or after the effective date.

VI. Conflicting agreements

- A. Notwithstanding any other provision in this policy to the contrary, nothing in the policy will be construed to limit the university from entering into specific written agreements with any **faculty**, staff, or student or with any third party (including in connection with **sponsored research**) that will specify different terms regarding the ownership, distribution, and commercialization of **intellectual property**. Such an agreement will supersede the terms of this policy if:
 - 1. The **creator** is a party to such an agreement; or
 - 2. The **creator** explicitly or implicitly consented to the terms of such an agreement prior to the creation of the **intellectual property**. Without limiting the generality of the foregoing, a decision of a **creator** to develop **intellectual property** under circumstances in which the **creator** knows, or should know, that such **intellectual property** is subject to an agreement will be considered consent to that agreement. However, continued employment or affiliation with the university is not, by itself, sufficient to establish consent as required by this section.
- B. Nothing in the policy will be construed to limit the university from entering into agreements with respect to the commercialization of **university IP**. Subject to subsection VI.A, those agreements would not undermine the university’s obligations under this policy, and in particular, the arrangements set forth in section V.



Applies to: Faculty, staff, and students

PROCEDURE

Issued: 05/03/1985

Revised: 04/15/2018 (target date)

VII. Intellectual property Evaluation, Protection, and Dissemination

- A. The senior vice president for business and finance and the provost will implement this policy on behalf of the university. All or a portion of the administration of activities with respect to this policy, except with respect to the responsibilities to administer disputes as set forth in section VIII, may be delegated to other university officials. In consultation with the provost, the senior vice president for business and finance, the senior vice president for research, and IPPC, the vice president responsible for TCO operations will establish operational guidelines and procedures, subject to the terms of this policy, for the administration of **university IP**. This will include, but is not limited to, determination of ownership, assignment, protection, licensing, marketing, maintenance of records, and oversight of revenue collection.
- B. In all its decisions pursuant to this policy, TCO will strive to reasonably: (i) advance the well-being of the people of Ohio and the global community by supporting the creation and dissemination of knowledge, and (ii) maximize the commercial value of **university IP**. Without limiting the foregoing, TCO will:
 1. facilitate evaluation of **university IP**, including consideration of the market for such **university IP** and the competitive market landscape;
 2. identify potential commercial partners for **university IP**, which may include using multiple networks of contacts, including those made available from the **creator(s)**, alumni, and other sources;
 3. negotiate agreements, licensing or otherwise, in connection to the commercialization of **university IP**;
 4. take any other actions reasonably necessary to facilitate the commercialization of **university IP**; and
 5. consult, as reasonably needed, with other constituencies, including university units.
- C. The university trusts **faculty**, staff, and students to participate throughout the **intellectual property** creation and preservation process. **Creators** must promptly disclose in writing all **university IP** they created with commercial value and other **university IP** required to be disclosed pursuant to an obligation to a third party (such as obligations in connection with **sponsored research** arrangements), using a disclosure form.
 1. The disclosure must:
 - a. provide a full and complete description of the **university IP**;
 - b. describe the funding sources used in development of such **university IP**; and
 - c. identify all persons participating in the creation and development of the **university IP**.
 2. Upon request from TCO, the **creator(s)** will furnish any additional reasonable information, including the know-how related to the invention or discovery, and will execute documents in connection with the **university IP**, such as assignments and declarations.
 3. **Faculty**, staff, and students may ask the TCO to verify that pursuant to this policy a specific **intellectual property** is not **university IP** or that it is available for a certain specific use.
- D. Upon receipt by TCO of a disclosure form as described in subsection VII.C, the case will be assigned to a TCO representative. The assigned representative will facilitate evaluation of the **intellectual property** with respect to patentability, commercial potential, and obligations to sponsors or other third parties. This process will include:
 1. a discussion with the **creator(s)** led by the TCO representative;
 2. a search of prior art, if necessary. The TCO representative may reasonably request that the **creator(s)** participate in such search; and
 3. determination of whether **intellectual property** protection, and in particular patent protection, should be pursued, taking into consideration, among other things, commercial potential. Although patent protection is sometimes sought for various noncommercial reasons, such as professional status, TCO will not seek protection for **university IP**, including patent protection, that is not deemed to have commercial potential (even if the **university IP** is intellectually meritorious), unless such protection (i) is requested by the sponsor of **sponsored research** and such sponsor pays for such protection or (ii) is authorized by the senior vice president for business and finance or the provost, at their sole discretion. The evaluation of the



Applies to: Faculty, staff, and students

commercial potential will be based upon, among other things, patentability, scope of potential patent coverage, size of market, competition, and potential market share. The provost and/or the senior vice president for business and finance may establish guidelines regarding the role of the university's units in the process of commercializing and/or protecting the **university IP**.

- E. TCO will regularly update the **creator(s)** on the status of the **university IP** disclosed by such **creator(s)**.
 - 1. TCO will provide the first status update within three months of receiving the disclosure form and a second status update within six months of the date of receipt of a disclosure form. Such status updates will include, but not be limited to, any filing decisions regarding **intellectual property** protection or transfer of the **university IP**.
 - 2. TCO will provide a detailed summary of substantive decisions regarding protection, commercialization, and/or transfer of **intellectual property** promptly after those decisions are made.
- F. In some cases **university IP** will be assigned to its **creator(s)**.
 - 1. Under the following circumstances, **creator(s)** will be allowed to require (subject to any required third party approvals, e.g., approval of a federal funding agency) assignment, free of charge, of **university IP** to them, and TCO will promptly effect such assignment:
 - a. The **creator(s)** provide TCO with evidence of a concrete potential commercialization partner for the **university IP**, such as a potential licensee thereof, and TCO does not complete, in good faith, its review and determination of the university's interest in such opportunity within six months.
 - b. The **university IP** may reasonably be protected by a patent, and TCO does not complete, in good faith, its review and determination of the university's interest in such **university IP** within six months of TCO becoming aware of a public disclosure of such **university IP**. Public disclosure under this section includes any disclosure that will make the **university IP** ineligible for patent protection in the United States, unless patent application is filed within one year of such disclosure.
 - c. TCO does not complete, in good faith, its review and determination of the university's interest in such **university IP** within twelve months of receipt of a disclosure form.
 - 2. The assignment of **university IP** under subsection VII.F.1 will be subject to the following:
 - a. The TCO may reasonably delay, and in extreme cases deny, a request pursuant to subsection VII.F.1 if the **creator's** disclosure pursuant to subsection VII.C lacks material details in bad faith or if the **creator** failed to cooperate in good faith with TCO's reasonable requests;
 - b. All **creators** who are assigned the **university IP** pursuant to subsection VII.F.1 will grant the university a perpetual, worldwide, nonexclusive, royalty-free license limited to non-commercial use of such **intellectual property**; and
 - c. The assignment of **university IP** to the **creator** pursuant to subsection VII.F.1 will not affect any other obligations of the **creator**, including the obligation of disclosure and cooperation, set forth in subsection VII.C, with respect to any other **university IP**.
 - 3. TCO is encouraged to cause assignment to **creators** any **university IP** which, in TCO's discretion, is not currently commercialized by the university or on its behalf and is not expected to be commercialized by the university or on its behalf in the foreseeable future, unless such assignment would have an adverse impact on the ability to commercialize other **university IP** or such assignment cannot be legally made for any reason (e.g., a required third party approval was not secured). The university and **OSIF** may place terms on such assignment including requiring, at TCO's discretion, payment in consideration for such assignment.
 - 4. In the case of multiple **creators**, the university or **OSIF** will assign the **intellectual property** to all **creators** according to this subsection VII.F as joint owners, unless all **creators** agree in writing to a different arrangement. Except for assignment to the **creator(s)** according to this subsection VII.F (or an assignment from the university to **OSIF**), the university and **OSIF** will not assign **university IP** for no consideration.
 - 5. TCO will update the **creator's** unit of any assignment of **university IP** to the **creator** pursuant to this section VII.F.
- G. University employees engaged in external consulting work or business, and those charged with approving such activities, are responsible for ensuring that agreements with external entities do not violate or conflict

Applies to: Faculty, staff, and students

with this policy or any other university policy, including the Faculty Paid External Consulting policy and the Conflict of Interest and Work Outside the University policy.

VIII. Policy Interpretation and Dispute Resolution

- A. University constituents (such as **creators**, **creators'** units, employees, and TCO) should make every attempt to resolve disputes informally among themselves and, if needed, with the assistance of the Office of Academic Affairs, the university Ombudsman, and/or the Office of Legal Affairs.
- B. If informal processes and consultation do not provide resolution of a dispute regarding this policy, the following actions may be taken:
 1. Any person or entity directly affected by decisions or actions of any other person or entity in connection with this policy, may appeal such decisions or actions to the IPPC if such person or entity (the claimant) believes such decisions or actions are inconsistent with this policy.
 2. The claimant will submit the complaint in writing to the chair of the IPPC, who will determine whether the claimant has made a reasonable effort to resolve the dispute informally and whether the substance of the dispute appears to be within the scope of the IPPC's review authority under this policy.
 3. Proceedings will be informal, but all parties will have adequate notice and an opportunity to be heard. The IPPC may establish additional procedures for resolving such disputes and may designate a sub-committee of its members for such procedures.
 4. After considering all relevant information and within 30 days of receipt of the complaint, the IPPC will prepare and send to the senior vice president for business and finance and the provost a report of its findings on the issues raised by the complaint and any corrective actions it recommends, within the scope of this policy.
 5. Within 30 days of receipt of the IPPC report, the senior vice president for business and finance and/or the provost will review the IPPC report and make a final decision on behalf of the university and provide this decision to all the parties involved and IPPC.
 6. IPPC will publish its reports (after removing certain information, as needed, to address reasonable privacy or secrecy concerns) and the decisions of the senior vice president for business and finance and/or the provost. The publication will be reasonably accessible to the university community. Those reports and decisions will guide future actions and decisions by the TCO and IPPC.

IX. Policy Review and Revisions

- A. IPPC shall maintain this policy and shall review it and its effect, from time to time, as needed. IPPC shall review all proposed changes to this policy, and shall have the power to initiate its own proposed changes to this policy. The chair of IPPC shall be a member of the policy writing group for any revisions to this policy. Revisions to this policy shall be promulgated through the university policy process and then recommended to faculty council and the university senate. All revisions to this policy must be approved by the faculty council and the university senate, in addition to the other approvals required by the university policy process.

Responsibilities

Position or Office	Responsibilities
Creator(s)	<ol style="list-style-type: none"> 1. Disclose in writing to TCO all university IP with commercial value and other university IP required to be disclosed pursuant to an obligation to a third party (such as sponsored research arrangements) as set forth in the policy 2. Assist TCO in the commercialization process as set forth in the policy 3. Assign university IP to the university 4. Grant the university licenses as set forth in the policy
Employees engaged in external consulting and those charged with approving such activities	Ensure that agreements with external entities do not conflict with this policy, or other university policies, including the Faculty Paid External Consulting policy and Conflict of Interest and Work Outside the University policy
IPPC	<ol style="list-style-type: none"> 1. Administer the dispute resolution process as set forth in the policy 2. Approve and/or consult the vice president responsible for TCO operations, TCO, and the Office of Research in connection with certain guidelines and procedures as set forth in the policy

Applies to: Faculty, staff, and students

Position or Office	Responsibilities
	3. Review the policy and its effects from time to time and proposed and review changes thereto as set forth in the policy
IPPC Chair	1. Administer the dispute resolution process as set forth in the policy 2. Participate in the policy writing group activities for any revisions to the policy
Office of Research	1. Review TAF proceeds distribution plans submitted by principal investigators as set forth in this policy 2. Establish guidelines, in consultation with IPPC and TCO, for the distribution of Ohio State proceeds when there are no identifiable creators of tangible research property
OSIF	Distribute proceeds received for university IP as set forth in the policy
Principal Investigators	Propose to Office of Research a distribution plan for TAF proceeds as set forth in the policy
Provost	1. Establish instructions and guidelines with respect to the distribution of certain Ohio State proceeds 2. Together with SVP for B&F, implement the policy as set forth therein 3. Together with SVP for B&F, review IPPC reports regarding disputes pertaining to the policy and make a final decision on behalf of the university as set forth in the policy
Senior vice president for business and finance (SVP for B&F)	1. Together with the provost, implement the policy as set forth herein 2. Together with the provost, review IPPC reports regarding disputes pertaining to the policy and make a final decision on behalf of the university as set forth in the policy
TCO	1. Consider requests from unit heads or deans to assign copyrights to staff- creators and report to IPPC the type of such requests approved and denied 2. Distribute proceeds received for university IP as set forth in the policy 3. Facilitate the commercialization of university IP as set forth in the policy 4. Facilitate the evaluation of the patentability, commercial potential, and obligations to sponsors or third parties of all intellectual property disclosed to TCO as set forth in the policy 5. Update creators on the status of disclosed university IP as set forth in the policy 6. Cause university IP to be assigned to its creators under certain limited circumstances as set forth in the policy and update the creators' units of any such assignments 7. At the request of faculty , staff, or students, verify that a specific intellectual property is not university IP or that it is available for a certain specific use pursuant to the policy
Unit heads and deans	May submit applications to TCO requesting that the university assign certain copyrights to staff- creator(s)
Vice president responsible for TCO	In consultation with the provost, SVP for B&F, SVP for research, and IPPC, establish operational guidelines and procedures for the administration of university IP subject to the terms of the policy
University	1. Assigns certain intellectual property to their creators as set forth in the policy 2. Grants licenses to use software not eligible for patent protection to its creator(s) and others for certain purposes as set forth in the policy 3. Distribute proceeds received for university IP as set forth in the policy

Resources

Forms

Disclosure forms, tco.osu.edu

University Policies and Rules

Conflict of Interest and Work Outside the University policy, hr.osu.edu/public/documents/policy/policy130.pdf

Faculty Paid External Consulting policy, oaa.osu.edu/assets/files/documents/paidexternalconsulting.pdf

Research Misconduct policy, orc.osu.edu/files/Misconduct_Policy.pdf

Faculty Rule 3335-5-19, trustees.osu.edu/index.php?q=rules/university-rules/chapter-3335-5-faculty-governance-and-committees.html

Additional Guidance

Ohio Revised Code §3345.14, codes.ohio.gov/orc/3345.14

Frequently Asked Questions (FAQs) **[to be developed]**

Academic misconduct information for students, oaa.osu.edu/academic-integrity-and-misconduct/student-misconduct

Academic misconduct information for faculty, oaa.osu.edu/academic-integrity-and-misconduct/faculty-obligations



Applies to: Faculty, staff, and students

OSU-OARDC Plant Germplasm Release Guidelines and Practices Special Circular 178-01, Royalty Distribution
Associated with Licensed Plant Varieties,
kb.osu.edu/dspace/bitstream/handle/1811/71922/OARDC_special_circular_n178.pdf?sequence=1

Contacts

Subject	Office	Telephone	E-mail/URL
Dispute resolution; policy changes	The committee on Intellectual Property, Patents, and Copyrights (IPPC)	614-292-2423	lppc@osu.edu senate.osu.edu
Policy administration; general inquiries	Technology Commercialization Office	614-292-1315	innovation@osu.edu tco.osu.edu

History

Issued: 05/13/1985	Approved by BOT, 05/03/1985, Resolution #85-117; Issued as Patents and Copyrights
Revised: 05/04/1989	Approved by BOT, 05/04/1989, Resolution #89-97
Revised: 04/15/2018	Approved by University Senate, 03/08/2018; Approved by BOT, xx/xx/xxxx, Resolution #xx-xx ; Renamed Intellectual Property

AMENDMENTS TO THE RULES OF THE UNIVERSITY FACULTY

Synopsis: Approval of the following amendments to the *Rules of the University Faculty*, is proposed.

WHEREAS the University Senate, pursuant to rule 3335-1-09 of the Administrative Code, is authorized to recommend through the president to the Board of Trustees the adoption of amendments to the *Rules of the University Faculty* as approved by the University Senate; and

WHEREAS the proposed changes to rule 3335-19-03 in the *Rules of the University Faculty* were approved by the University Senate on November 20, 2014; and

WHEREAS the proposed changes to rule 3335-13-04 and rule 3335-13-05 in the *Rules of the University Faculty* were approved by the University Senate on January 25, 2018:

NOW THEREFORE

BE IT RESOLVED, That the Board of Trustees hereby approves that the attached amendments to the *Rules of the University Faculty* be adopted as recommended by the University Senate.

To: University Senate

**From: Bill Brantley, Chair
Rules Committee**

Date: October 23, 2014

A PROPOSAL FROM THE RULES COMMITTEE TO AMEND FACULTY RULE 3335-19-03

WHEREAS Seven days are now required as advance notice of the senate agenda for all members and alternate members of the senate; and

WHEREAS Seven days advance notice is not possible because the steering committee that sets the senate agenda schedules its regular meetings fewer than seven days before every senate meeting; and

WHEREAS Five days advance notice of senate agendas is sufficient for electronic distribution;

NOW THEREFORE BE IT RESOLVED that the University Senate approve the proposed changes to the Rules of the University Faculty and respectfully request the concurrence of the Board of Trustees, said proposal to be effective upon approval by the Board of Trustees.

3335-19-03 Agenda.

(C) The secretary of the university senate shall send and make available electronically copies of the agenda for all senate meetings to all members and alternate members at least ~~seven~~five days prior to the meeting.

3335-13-04 Duplication of keys or other access devices.

Except as specifically authorized by the president, his or her designee, or a university official authorized to make decisions regarding the issuance of university keys or other access devices, no person shall knowingly make or cause to be made any key or other access device for any building, laboratory, facility, or room of the university.

(Board approval date: 4/12/63)

3335-13-05 Control of dogs and other animals.

(A) No person, ~~being the owner or keeper, or harboring or having charge of any dog or other animal,~~ shall permit a dog or other animal under his or her ownership or control ~~the same~~ upon the grounds of the ~~Ohio state~~ university unless it be underis on the personal control of its owner or keeper by a leash or harness not more than six feet in length and under the owner or keeper's handler's personal control, unless otherwise permitted to do so by the university. A dog or other animal that is, leashed or harnessed but unattended, is not under the personal control of its owner or keeper.

(B) ~~No, shall such a person, being the owner or keeper or harboring or having charge of any dog or other animal,~~ shall permit a dog or other animal under his or her ownership or control to ~~permit the same in~~enter any university building or housing, except for ~~seeing eye dogs~~service animals, therapy animals, support animals, and/or any other type of animal approved by the University to accompany individuals in such areas provided that the person complies with any restrictions or limitations set by the University provided that and such animal remains under the personal control of its owner or keeper handler in accordance with paragraph (A) of this rule. This rule shall not, however, prevent, persons from bringing animals into university buildings when accompanying their masters and except for animals brought by their owner or keeper for use for approved research purposes or for observation or care by university veterinary clinic personnel.

~~(C)~~ Any dog or other animal found upon the grounds of the ~~Ohio state~~ university or in any university building, except as permitted pursuant to the provisions of paragraphs (A) and (B) of this rule, may be taken into custody by university authorities. University authorities ~~shall, as soon as practicable after assuming custody thereof, may, in their discretion,~~ turn the dog or other animal over to appropriate county or municipal authorities for delivery to the custody of the humane society or other animal shelter. In such an event, the owner or keeper handler must contact the entity to which the animal was delivered to recover the animal in accordance with that entity's rules. Release from custody should be sought pursuant to the society's rules. The university may further require the owner or keeper handler of such a dog or other animal

~~(C)~~ The owner or keeper of any dog or other animal taken into custody by university officials pursuant to this rule shall pay a fine to the university, upon presentation of a bill therefor, to reimburse the university for costs incurred in impounding the dog or other animal and turning it over to the control and custody of county or municipal authorities.

(Board approval dates: 7/31/1969, 9/2/1971, 9/10/1976, 8/29/2001)

FACULTY PERSONNEL ACTIONS

BE IT RESOLVED, That the Board of Trustees hereby approves the faculty personnel actions as recorded in the personnel budget records of the university since the February 2, 2018, meeting of the board, including the following appointments, appointments/reappointments of chairpersons, faculty professional leaves, and emeritus titles:

Appointments

Name: BRADLEY J. NEEDLEMAN
Title: Professor-Clinical (Edwin H. and E. Christopher Ellison Professorship)
College: Medicine
Term: April 5, 2018 through April 4, 2022

Name: ANIL V. PARWANI
Title: Professor-Clinical (Donald A. Senhauser, MD, Chair in Pathology)
College: Medicine
Term: January 1, 2018 through December 31, 2021

Name: *BENJAMIN K. POULOSE
Title: Professor (Robert M. Zollinger LeCrone-Baxter Memorial Endowed Chair in Surgery)
College: Medicine
Term: August 1, 2018 through July 31, 2022

Name: ALICIA L. BERTONE
Title: Vice Provost for Graduate Studies
Office: Academic Affairs
Title: Dean
College: The Graduate School
Term: April 16, 2018 through June 30, 2021

*New Hire

Appointments/Reappointments of Chairpersons

LISA J. DOWNING, Chair, Department of Philosophy, effective July 1, 2018 through June 30, 2022

SIMONE C. DRAKE, Chair, Department of African-American and African Studies, effective June 1, 2018 through June 30, 2022

SAMIR N. GHADIALI, Chair, Department of Biomedical Engineering, effective September 1, 2018 through May 31, 2022

**ANDREW H. GLASSMAN, Chair, Department of Orthopedics, effective July 1, 2017 through June 30, 2021

*LANG LI, Chair, Department of Biomedical Informatics, effective July 1, 2017 through June 30, 2021

**MICHAEL J. MILLER, Chair, Department of Plastic Surgery, effective July 1, 2017 through June 30, 2021

PHILLIP G. POPOVICH, Interim Chair, Department of Neuroscience, effective January 5, 2018 through January 4, 2019

JAMES ROCCO, Chair, Department of Otolaryngology-Head and Neck Surgery, effective December 1, 2017 through November 30, 2021

HARALD E. VAESSIN, Chair, Department of Molecular Genetics, effective June 1, 2018 through May 31, 2022

**Reappointment

*New Hire

Faculty Professional Leaves

BENJAMIN ACOSTA-HUGHES, Professor, Department of Classics, effective Autumn Semester 2018

ROBERT A. AGUNGA, Associate Professor, Department of Agricultural Communication, Education and Leadership, effective Spring Semester 2019

ANNA M. BABEL, Associate Professor, Department of Spanish and Portuguese, effective Autumn Semester 2018 and Spring Semester 2019

ALISON I. BEACH, Associate Professor, Department of History, effective Autumn Semester 2018

SARAH M. BROOKS, Professor, Department of Political Science, effective Autumn Semester 2018

KATRA A. BYRAM, Associate Professor, Department of Germanic Languages and Literature, effective Autumn Semester 2018 and Spring Semester 2019

CINNAMON P. CARLARNE, Professor, College of Law, effective Spring Semester 2019

MARTHA E. CHAMALLAS, Professor, College of Law, effective Autumn Semester 2018 and Spring Semester 2019

JIAN N. CHEN, Assistant Professor, Department of English, effective Autumn Semester 2018

DAVID L. CLAMPITT, Professor, School of Music, effective Spring Semester 2019

RUTH COLKER, Professor, College of Law, effective Spring Semester 2019

PETER F. CRAIGMILE, Professor, Department of Statistics, effective Autumn Semester 2018 and Spring Semester 2019

MICHAEL W. DAVIS, Professor, Department of Mathematics, effective Spring Semester 2019

ROBERT M. DE JONG, Professor, Department of Economics, effective Spring Semester 2019

ELLEN E. DEASON, Professor, College of Law, effective Autumn Semester 2018 and Spring Semester 2019

XIAOYAN DENG, Associate Professor, Department of Marketing and Logistics, effective Spring Semester 2019

LOUIS F. DIMAURO, Professor, Department of Physics, effective Autumn Semester 2018

MICHAEL T. DURAND, Associate Professor, School of Earth Sciences, effective Autumn Semester 2018

ALLISON B. ELLAWADI, Associate Professor, Department of Speech and Hearing Sciences, effective Autumn Semester 2018 and Spring Semester 2019

WILLIAM P. EVELAND, Professor, School of Communication, effective Spring Semester 2019

JESSE A. FOX, Associate Professor, School of Communication, effective Spring Semester 2019

CHRISTOPHER M. HANS, Associate Professor, Department of Statistics, effective Spring Semester 2019

RADU HERBEI, Associate Professor, Department of Statistics, effective Spring Semester 2019

CHRISTOPHER F. HIGHLEY, Professor, Department of English, effective Spring Semester 2019

DAVID G. HORN, Professor, Department of Comparative Studies, effective Spring Semester 2019

GREGORY JUSDANIS, Professor, Department of Classics, effective Autumn Semester 2018 and Spring Semester 2019

HARRIS P. KAGAN, Professor, Department of Physics, effective Spring Semester 2019

CHRIS W. KNOESTER, Associate Professor, Department of Sociology, effective Autumn Semester 2018

CHRISTOPHER S. KOCHANNEK, Professor, Department of Astronomy, effective Autumn Semester 2018 and Spring Semester 2019

DMITRI S. KUDRYASHOV, Associate Professor, Department of Chemistry and Biochemistry, effective Autumn Semester 2018 and Spring Semester 2019

MARCUS J. KURTZ, Professor, Department of Political Science, effective Autumn Semester 2018

LAURA N. LISBON, Professor, Department of Art, effective Autumn Semester 2018

FERNANDO MARTINEZ-GIL, Associate Professor, Department of Spanish and Portuguese, effective Spring Semester 2019

REBECCA J. MCCAULEY, Professor, Department of Speech and Hearing Sciences, effective Autumn Semester 2018

SCOTT J. MCCOY, Professor, School of Music, effective Spring Semester 2019

KENDRA MCSWEENEY, Professor, Department of Geography, effective Autumn Semester 2018 and Spring Semester 2019

SUSAN E. MELSOP, Associate Professor, Department of Design, effective Autumn Semester 2018 and Spring Semester 2019

MARIA N. MIRITI, Associate Professor, Department of Evolution, Ecology and Organismal Biology, effective Autumn Semester 2018 and Spring Semester 2019

LUPENGA MPHANDE, Associate Professor, Department of African-American and African Studies, effective Spring Semester 2019

MARGARET E. NEWELL, Professor, Department of History, effective Spring Semester 2019

DALE A. OESTERLE, Professor, College of Law, effective Spring Semester 2019

JOHN E. OPFER, Professor, Department of Psychology, effective Autumn Semester 2018

NIKOLE D. PATSON, Associate Professor, Department of Psychology, effective Spring Semester 2019

ANA E. PUGA, Associate Professor, Department of Theatre, effective Autumn Semester 2018

SHELLEY F. QUINN, Associate Professor, Department of East Asian Languages and Literatures, effective Spring Semester 2019

JENNIFER T. RICHARDSON, Associate Professor, Department of Art Administration, Education and Policy, effective Autumn Semester 2018

EUGENIA R. ROMERO, Associate Professor, Department of Spanish and Portuguese, effective Autumn Semester 2018

MITCHELL ROSE, Associate Professor, Department of Dance, effective Spring Semester 2019

GUY A. RUB, Associate Professor, College of Law, effective Autumn Semester 2017 and Spring Semester 2018

TAMAR RUDAVSKY, Professor, Department of Philosophy, effective Autumn Semester 2018

BARBARA S. RYDEN, Professor, Department of Astronomy, effective Autumn Semester 2018

KRISTINA M. SESSA, Associate Professor, Department of History, effective Autumn Semester 2018

AMY E. SHUMAN, Professor, Department of English, effective Spring Semester 2019

JENNIFER SIEGEL, Professor, Department of History, effective Spring Semester 2019

CLARE A. SIMMONS, Professor, Department of English, effective Autumn Semester 2018

RYAN T. SKINNER, Associate Professor, School of Music, effective Autumn Semester 2018

STEPHANIE J. SMITH, Associate Professor, Department of History, effective Autumn Semester 2018

ALEXANDER S. THOMPSON, Associate Professor, Department of Political Science, effective Autumn Semester 2018 and Spring Semester 2019

TODD A. THOMPSON, Professor, Department of Astronomy, effective Autumn Semester 2018 and Spring Semester 2019

JOSEPH H. TIEN, Associate Professor, Department of Mathematics, effective Autumn Semester 2018 and Spring Semester 2019

JAMES T. TODD, Professor, Department of Psychology, effective Spring Semester 2019

SARAH VAN BEURDEN, Associate Professor, Department of History, effective Autumn Semester 2018 and Spring Semester 2019

SARA E. WATSON, Associate Professor, Department of Political Science, effective Autumn Semester 2018 and Spring Semester 2019

BALDWIN M. WAY, Associate Professor, Department of Psychology, effective Autumn Semester 2018 and Spring Semester 2019

DUANE T. WEGENER, Professor, Department of Psychology, effective Autumn Semester 2018

JENNIFER WILLGING, Associate Professor, Department of French and Italian, effective Autumn Semester 2018

ZHIGUO XIE, Associate Professor, Department of East Asian Languages and Literatures, effective Autumn Semester 2018

CHUAN XUE, Associate Professor, Department of Mathematics, effective Autumn Semester 2018

BURAK YILMAZ, Associate Professor, College of Dentistry, effective Autumn Semester 2018 and Spring Semester 2019

AMY M. YOUNGS, Associate Professor, Department of Art, effective Autumn Semester 2018 and Spring Semester 2019

YING ZHANG, Associate Professor, Department of History, effective Spring Semester 2019

HUI ZHENG, Associate Professor, Department of Sociology, effective Autumn Semester 2018 and Spring Semester 2019

Faculty Professional Leave Change

JENNIFER CROCKER, Professor, Department of Psychology, effective Autumn Semester 2017 only — change from Autumn Semester 2017 and Spring Semester 2018

Emeritus Titles

CHERYL L. ACHTERBERG, Department of Human Sciences, with the title Professor Emeritus, effective July 1, 2018

SUDHA AGARWAL, College of Dentistry, with the title Professor Emeritus, effective April 1, 2018

SAMUEL AMELL, Department of Spanish and Portuguese, with the title Associate Professor Emeritus, effective April 1, 2018

JAMES K. BELKNAP, Department of Veterinary Clinical Sciences, with the title Professor Emeritus, effective July 1, 2018

ROBERT J. BIRKENHOLZ, Department of Agriculture, Communications, Education and Leadership, with the title Professor Emeritus, effective September 1, 2018

DAVID M. BLAU, Department of Economics, with the title Professor Emeritus, effective July 1, 2018

PAMELA S. BRADIGAN, University Libraries, with the title Professor Emeritus, effective June 1, 2018

JILL M. BYSTYDZIENSKI, Department of Women's, Gender and Sexuality Studies, with the title Professor Emeritus, effective September 1, 2018

MICHELE P. CARR, College of Dentistry, with the title Associate Professor Emeritus, effective February 1, 2018

JOHN P. CHEATHAM, Department of Pediatrics, with the title Professor Emeritus, effective January 1, 2018

ROGER D. CHERRY, Department of English, with the title Associate Professor Emeritus, effective June 1, 2018

SUSAN H. DELAGRANGE, Department of English, with the title Associate Professor Emeritus, effective July 1, 2018

JOSEPH FIKSEL, Department of Integrated Systems Engineering, with the title Research Associate Professor Emeritus, effective April 1, 2018

RALPH GARDNER, Department of Educational Studies, with the title Professor Emeritus, effective August 1, 2018

JAVIER GUTIERREZ REXACH, Department of Spanish and Portuguese, with the title Professor Emeritus, effective April 1, 2018

ROBERT L. HENEMAN, Department of Management and Human Resources, with the title Professor Emeritus, effective June 1, 2018

GAIL E. HERMAN, Department of Pediatrics, with the title Professor Emeritus, effective July 1, 2017

NANCY J. JOHNSON, Department of English, with the title Professor Emeritus, effective August 1, 2018

L. JAMES LEE, Department of Chemical and Biomolecular Engineering, with the title Helen C. Kurtz Chair Emeritus, effective September 1, 2018

EDWARD J. MALECKI, Department of Geography, with the title Professor Emeritus, effective June 1, 2018

JULIE E. MANGINO, Department of Internal Medicine, with the title Professor-Clinical Emeritus, effective February 1, 2018

THELMA E. PATRICK, College of Nursing, with the title Associate Professor Emeritus, effective January 6, 2018

JOY H. REILLY, Department of Theatre, with the title Associate Professor Emeritus, effective January 1, 2017

MARK W. SHANDA, Department of Theatre, with the title Professor Emeritus, effective September 1, 2017

GAYLYNN J. SPEAS, Department of Anesthesiology, with the title Assistant Professor-Clinical Emeritus, effective January 1, 2018

ERIC E. SPIRES, Department of Accounting and Management Information Systems, with the title Associate Professor Emeritus, effective April 1, 2018

STANLEY R. THOMPSON, Department of Agricultural, Environmental and Development Economics, with the title Professor Emeritus, effective March 1, 2018

DAVID A. WILKIE, Department of Veterinary Clinical Sciences, with the title Professor Emeritus, effective June 30, 2018

JOHN W. WILKINS, Department of Physics, with the title Ohio Eminent Scholar Emeritus, effective January 1, 2018

COLLEGE OF MEDICINE

PROMOTION TO PROFESSOR

Yu, Jianhua, Internal Medicine, effective April 1, 2018

DEGREES AND CERTIFICATES

Synopsis: Approval of degrees and certificates for spring semester, is proposed.

WHEREAS pursuant to paragraph (E) of rule 3335-1-06 of the Administrative Code, the board has authority for the issuance of degrees and certificates; and

WHEREAS the faculties of the colleges and schools shall transmit, in accordance with rule 3335-9-29 of the Administrative Code, for approval by the Board of Trustees, the names of persons who have completed degree and certificate requirements; and

WHEREAS the College of Food, Agricultural and Environmental Sciences has recommended that Caroline "Grace" Cotter be awarded a Bachelor of Science in Agriculture, *Cum Laude*, posthumously; and

WHEREAS the College of Food, Agricultural and Environmental Sciences has recommended that Nicolas Petrykowski be awarded a Bachelor of Science in Agriculture, posthumously:

NOW THEREFORE

BE IT RESOLVED, That the Board of Trustees hereby approves the degrees and certificates to be conferred on May 6, 2018, to those persons who have completed the requirements for their respective degrees and certificates and are recommended by the colleges and schools; that Caroline "Grace" Cotter be awarded the above named degree, posthumously; that Nicolas Petrykowski be awarded the above named degree, posthumously; and that the names of those persons awarded degrees and certificates be included in the minutes of this meeting.

HONORARY DEGREES

Synopsis: Approval of the below honorary degrees, is proposed.

WHEREAS pursuant to paragraph (A)(3) of rule 3335-1-03 of the Administrative Code, the president, after consultation with the Steering Committee of the University Senate, recommends to the Board of Trustees the awarding of honorary degrees as listed below:

Joan Baez	Doctor of Humane Letters
Susan Desmond-Hellmann	Doctor of Science
Colin Powell	Doctor of Public Service

WHEREAS the Committee on Honorary Degrees and the University Senate, pursuant to rule 3335-5-48.8 of the Administrative Code, have approved for recommendation to the Board of Trustees the awarding of an honorary degree as listed below:

Matthieu Ricard	Doctor of Humane Letters
-----------------	--------------------------

NOW THEREFORE

BE IT RESOLVED, That the Board of Trustees hereby approves the awarding of the above honorary degrees.

Dr. Bennet Givens
University Senate
119 Independence Hall
1923 Neil Avenue
Columbus, OH 43210

February 19, 2018

Dear Dr. Givens,

The Committee on Honorary Degrees of the University Senate has carefully reviewed the dossier of Dr. Matthieu Ricard, a Buddhist monk, and the French translator of his Holiness the Dalai Lama, for an honorary degree from The Ohio State University. Dr. Benjamin Hoffmann, Assistant Professor of Early Modern French Studies brought the nomination forward.

Matthieu Ricard received a PhD in cell genetics in 1972, after working under the guidance of Nobel Prize Winner, François Jacob. After the completion of his doctoral work, he moved to the Himalayan region where he has been living for the past 45 years. An international best-selling author and a prominent speaker, he has authored and co-authored numerous books translated into over twenty languages, including *The Quantum and the Lotus* (a dialogue with the astrophysicist Trinh Xuan Thuan), and *The Monk and the Philosopher*, a dialogue with his father, the French philosopher Jean Francois Revel.

Dr. Ricard is a world-renowned scholar, has led critical global efforts centering on research and teaching of the contemplative practices. He has worked with scientists at Princeton, the University of Wisconsin at Madison and UC-Berkley to show how meditation re-trains the brain and creates new neural pathways that allow the brain to develop and change well into adulthood. He is an active member of the Mind and Life Institute, the premier society bringing together scholars and practitioners of contemplative sciences in order to foster growth and collaboration within this field.

Dr. Ricard is also a global humanitarian. He has been involved in several efforts, throughout the world, but especially in South Asia, benefiting the underprivileged. More recently, he extended his preaching of compassionate care and altruism to include all beings. His latest book, *A Plea for the Animals*, is a scientifically informed, well-written document, calling urgent attention to extend our care and respect to all animals that inhabit this planet with us. Since 2000, Dr. Ricard has used royalties from his many publications to help support the work of this charity, which has funded schools, hospitals and other organizations in India, Nepal and among Tibetan people in China. Dr. Ricard is a recipient of the French National Order of Merit award.

The interdisciplinary support this nomination received is worth highlighting. Faculty members in arts and sciences, library faculty in the humanities (French and Italian as well as East Asian Studies) and in psychology have come together to support this nomination of a scientist who although trained as a cell geneticist, has spent a lifetime demonstrating a commitment to compassion, contemplation, and health and wellness. His life and work represents the strength of merging science and art in order to make a difference in the world. This strength clearly mirrors

the foundational principles of the College of Arts and Sciences and The Ohio State University's public mission.

By a unanimous vote, the Committee on Honorary Degrees recommends that Dr. Matthieu Ricard's dossier be forwarded to the University Senate for their consideration, and recommends the title of Doctorate of Humane Letters *honoris causa*

Respectfully submitted,

José O. Díaz

Jose O. Diaz, Ph.D.

Associate Professor

Chair, Senate Honorary Degrees Committee

REVOCATION OF AN HONORARY DEGREE

Synopsis: Revocation of an honorary Doctor of Education degree, is proposed.

WHEREAS an administrative review was conducted regarding the presidential honorary Doctor of Education degree granted to William H. Cosby Jr. on June 8, 2001; and

WHEREAS a determination was made by the appropriate bodies to request that the Board of Trustees effectuate the revocation of said presidential honorary degree; and

WHEREAS the request was concurred with by the president and the executive vice president and provost; and

WHEREAS the request was further concurred with by the University Senate Steering Committee and the Academic Affairs and Student Life Committee of the Board of Trustees; and

WHEREAS the appropriate bodies of the university have fully complied with applicable procedures and in accordance with those procedures:

NOW THEREFORE

BE IT RESOLVED, That the Board of Trustees hereby approves the revocation of the presidential honorary Doctor of Education degree granted to William H. Cosby Jr. on June 8, 2001.

**ESTABLISHMENT OF A DOCTOR OF PHILOSOPHY
IN ENGINEERING EDUCATION DEGREE PROGRAM**

COLLEGE OF ENGINEERING

Synopsis: Approval to establish a Doctor of Philosophy in Engineering Education degree program in the College of Engineering, is proposed.

WHEREAS the program will lead to the terminal degree for the new Department of Engineering Education – an entry-level, interdisciplinary research program that combines the disciplines of engineering and education; and

WHEREAS among the goals of the program are that the successful graduate will be able to identify, discuss and address critical issues facing engineering education in alignment with stakeholder needs; design, conduct and critique research in engineering education; and create, teach and assess courses and curricula in engineering; and

WHEREAS the curriculum includes core courses, research methods courses, specialization electives and traditional engineering course work, along with dissertation research; and employment opportunities for graduates exist in colleges and universities, foundations and nonprofit organizations; and

WHEREAS no similar programs exist within Ohio and this one aligns clearly with both the research and land-grant missions of this university; and

WHEREAS the program will be administered by the Department of Engineering Education through a Graduate Studies Committee; is a part of the strategic planning of that department; has the resources, both current and planned, to be established and maintained; and has the support of the leadership of the College of Engineering; and

WHEREAS the proposal was thoroughly reviewed by a joint committee of the Council on Academic Affairs and the Graduate Council, and then was approved by the full Council on Academic Affairs at its meeting on November 1, 2017;

WHEREAS the University Senate reviewed and approved the proposal to establish a Doctor of Philosophy in Engineering Education degree program on January 25, 2018:

NOW THEREFORE

BE IT RESOLVED, That the Board of Trustees hereby approves the proposal to establish a Doctor of Philosophy in Engineering Education degree program.

M e m o r a n d u m

To: University Senate
From: Maria N. Miriti, Chair, Council on Academic Affairs
Subject: Ph.D. in Engineering Education Degree Program
Date: January 8, 2018

A PROPOSAL FROM THE COUNCIL ON ACADEMIC AFFAIRS TO ESTABLISH A DOCTOR OF PHILOSOPHY IN ENGINEERING EDUCATION DEGREE PROGRAM, COLLEGE OF ENGINEERING

- Whereas the program will lead to the terminal degree for the new Department of Engineering Education – an entry level, interdisciplinary research program that combines the disciplines of engineering and education;
- Whereas among the goals of the program are that the successful graduate will be able to: identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs; design, conduct, and critique research in engineering education; and create, teach, and assess courses and curricula in engineering; and
- Whereas the curriculum includes core courses, research methods courses, specialization electives, and traditional engineering course work, along with dissertation research; and employment opportunities for graduates exist in colleges and universities, foundations, non-profit organizations; and
- Whereas no similar programs exist within Ohio and this one aligns clearly with both the research and land grant missions of this university; and
- Whereas the program: will be administered by the Department of Engineering Education through a Graduate Studies Committee; is a part of the strategic planning of that Department; has the resources, both current and planned, to be established and maintained; and has the support of the leadership of the College of Engineering; and
- Whereas the proposal was thoroughly reviewed by a joint committee of the Council on Academic Affairs and the Graduate Council, and then was approved by the full Council on Academic Affairs at its meeting on November 1, 2017;

Therefore be it resolved that the University Senate approve the proposal to establish a Doctor of Philosophy in Engineering Education degree program and respectfully request approval by the Board of Trustees.

From: [Smith, Randy](#)
To: [Christy, Ann](#); kajfex.2@osu.edu; [Tomasko, David](#)
Cc: [Smith, Randy](#); [Reed, Katie](#); [Miriti, Maria](#); [Herness, Scott](#); [Schlueter, Jennifer](#); [Miner, Jack](#); [Williams, David B.](#); [McPheron, Bruce A.](#); [Schmiesing, Ryan](#); [Wolf, Kay](#); [Whitacre, Caroline](#); [Weisenberger, Jan](#); [Givens, Bennet](#); [Schweikhart, Sharon](#); [Lilly, Blaine](#); [Torma, Hannah](#); [Thompson, Blake](#); [Cox, Monica F.](#); [Kemp, Kathleen](#); [Harris, Brad](#); [Hofherr, Michael B.](#); [Hume, Beth](#); [Manderscheid, David C.](#); [Jaggars, Damon E.](#); [Ako-Adounvo, Gifty](#); [Adams-Gaston, Javaune](#); [Myers, Stephen](#); [Krissek, Lawrence](#); [Montalto, Catherine](#); [Kalish, Alan](#); [Freuler, Rick](#)
Subject: Ph.D. in Engineering Education
Date: Wednesday, November 1, 2017 4:13:36 PM
Attachments: [image001.png](#)

Ann, Rachel, and David:

Following its detailed review by the joint committee of the Council on Academic Affairs and the Graduate Council, the proposal from the Department of Engineering Education to establish a degree program leading to the Doctor of Philosophy degree, was approved by the full Council on Academic Affairs at its meeting on November 1, 2017. Thank you for attending the meeting to respond to questions/comments.

The proposal will now be sent to the University Senate with a request that it be included on the agenda of the Senate meeting on January 18, 2018. Professor Maria Miriti, Chair of the Council on Academic Affairs, will present the proposal, but it will be important for you to attend that meeting and I will send details as we get closer to it. If approved there, it will be sent to the Office of the Board of Trustees with a request for action at the Board meeting on February 2, 2018. Throughout this process Professor Scott Herness, Interim Dean of the Graduate School, will work with you on approval through the Ohio Department of Higher Education.

Please keep a copy of this message for your file on the proposal and I will do the same for the file in the Office of Academic Affairs.

If you have any questions please contact Professor Miriti (.1) or me.

I am well aware that this is an exciting time for the new Department – its faculty, students and staff – and what a milestone event having this new degree will be.

Congratulations on the successful completion of this very important stage of the review/approval process!

Randy



W. Randy Smith, Ph.D.

Vice Provost for Academic Programs

Office of Academic Affairs

203 Bricker Hall, 190 North Oval Mall, Columbus, OH 43210

614-292-5881 Office

smith.70@osu.edu

TO: Randy Smith, Vice Provost for Academic Programs
FROM: Jennifer Schlueter, Faculty Fellow for Curriculum, Graduate School
DATE: 24 October 2017
RE: Proposal for a new PhD in Engineering Education

The College of Engineering is proposing a new PhD in Engineering Education, which will build upon the Department of Engineering Education's work in engineering education research, emphasizing teaching as a way of knowing. Support has been obtained from the College of Education and Human Ecology's Department of Teaching and Learning.

The proposal was received by the Graduate School in June 2017. It was reviewed by the combined GS/CAA Curriculum subcommittee, chaired by Interim Dean Herness, on 1 June 2017, and revisions were requested on 9 June 2017. Revisions were received in September 2017, and the proposal received its second review by the combined GS/CAA Curriculum subcommittee, now chaired by the Faculty Fellow, on 6 October 2017. Small revisions were requested. These revisions were received on 13 October 2017. The Faculty Fellow forwarded it on to the Graduate Council for their review on 13 October 2017. The proposal was reviewed and approved at the Graduate Council on 23 October 2017. The positive results of this review were shared with the proposers on 24 October 2017.

From: [Christy, Ann](#)
To: [Schlueter, Jennifer](#)
Cc: [Herness, Scott](#); [Toft, Jill A.](#)
Subject: Re: GS/CAA curriculum subcommittee review of revised proposal for PhD in Engineering Education
Date: Friday, October 13, 2017 1:48:17 PM

Greetings:

Thank you for sharing the good news. After polling our Engineering Education graduate studies committee members, I have constructed our response to the two questions raised by the GS/CAA subcommittee:

- 1.) "We see on page 3 line 14 that 30 credit hours beyond the BA may be transferred into this program. This would mean that an OSU student currently enrolled in a traditional engineering program might be able to shift career paths by applying for admission and, if accepted, transferring in 30 completed hours. One reviewer wondered if there is planned or current potential for a transfer to the PhD for pre/post candidacy graduate students in traditional engineering departments?"

Yes, assuming that their 30 credits align with the courses in our program. Most likely they will not have taken education courses so they would only be transferring in technical disciplinary engineering courses and maybe research methods courses. However, it is possible for someone to do this.

- 2.) "We see in Appendix 2c the route through the degree for a student who does not hold the M.S. Is there a planned or current potential for a student in this PhD program who clears the candidacy exam to qualify for the M.S.?"

Not at this time, since we don't have a master's program. However, we'd like to have one eventually, and will include this information in any masters program proposal that we submit in the future. We are currently planning to work on a master curriculum design institute under UCAT guidance next summer (Su 2018).

I hope this message answers your concerns, and I assume the proposal itself does not need to be revised at this time. However, please let me know if you would prefer some additional language added to the proposal.

Best regards,
Ann



Ann D. Christy, Ph.D., P.E.

Assistant Dean for Teaching and Learning, College of Engineering
Professor, Department of Engineering Education
Professor, Department of Food, Agricultural, and Biological Engineering

221 Hitchcock Hall (office)
244 Hitchcock Hall (mailing address)
2070 Neil Avenue, Columbus, OH 43210
614-292-3171 Office
614-292-6255 Fax
christy.14@osu.edu

From: "Schlueter, Jennifer" <schlueter.10@osu.edu>
Date: Friday, October 6, 2017 at 4:02 PM
To: "Ann D. Christy" <christy.14@osu.edu>
Cc: "Herness, Scott" <herness.1@osu.edu>, "Toft, Jill A." <toft.20@osu.edu>
Subject: GS/CAA curriculum subcommittee review of revised proposal for PhD in Engineering Education

Dear Professor Christy:

At its October 6 meeting, the combined GS/CAA curriculum subcommittee (which I chair as Faculty Fellow) reviewed your revised proposal for a new PhD in Engineering Education. The subcommittee was quite satisfied with your responses to the queries made over the summer and remains extremely enthusiastic about this new program.

Some questions arose about consideration that has been given to alternative routes through this new degree. They include:

- We see on page 3 line 14 that 30 credit hours beyond the BA may be transferred into this program. This would mean that an OSU student currently enrolled in a traditional engineering program might be able to shift career paths by applying for admission and, if accepted, transferring in 30 completed hours. One reviewer wondered if there is planned or current potential for a transfer to the PhD for pre/post candidacy graduate students in traditional engineering departments?
- We see in Appendix 2c the route through the degree for a student who does not hold the M.S. Is there a planned or current potential for a student in this PhD program who clears the candidacy exam to qualify for the M.S.?

Upon receipt of your answers to these questions, we will be delighted to forward this proposal on to the Graduate Council for their review and approval and, subsequently, to CAA for theirs. I'll keep you posted as it moves along.

Best,
Jen

Jennifer Schlueter, PhD

Associate Chair, Department of Theatre
Associate Professor | Lab Series Coordinator | Editor, Theatre/Practice
Faculty Fellow, Curriculum, Graduate School

1103 Drake Center, 1849 Cannon Dr, Columbus, OH 43210
614-688-3778



September 5, 2017

Dr. Scott Herness
Interim Vice Provost for Graduate Studies
Interim Dean of the Graduate School
The Ohio State University
250 University Hall
230 North Oval Mall
Columbus, OH 43210

RE: Response to Review of Proposal to Establish a PhD in Engineering Education

Greetings Dr. Herness:

Thank you for your detailed review of our proposal to establish a PhD in Engineering Education at the Ohio State University. Attached is our revised proposal which addresses each of the requests for clarifications and other suggestions made by the Graduate School / Council on Academic Affairs curriculum subcommittee as communicated in your letter dated June 9, 2017. Below is an itemized list of those changes and where in the revised document the changes can be found.

1. **Nature of scholarship and types of dissertation topics:** The nature of scholarship in the field of engineering education is described in more detail on pages 2 (lines 24-40) and 10 (lines 8-20). The proposed degree is a research doctorate, and this has been more explicitly stated on pages 1 (line 9) and 3 (line 14). Types of dissertation topics are described, citing current research being pursued by OSU faculty in the department (page 7, line 37 to page 8, line 12) and ten years of dissertation titles from benchmark engineering education graduate programs at Purdue University and Virginia Tech (page 8, lines 14 - 22 and Appendix 2e, pages 1-3), the two oldest and most respected engineering education programs in the U.S.
2. **Faculty Numbers:** The section describing faculty numbers, "P" status, and collaboration with the College of Education and Human Ecology has been expanded (page 18, line 23 to page 19, line 2), as has the section describing the College of Engineering's commitment to hiring tenure track faculty in the near future (page 22, lines 5-10).
3. **Advising:** Students would be advised through the elective portion of the program, leading to an individualized experience. A student advising sheet has been developed which is described on page 7 (lines 1-8) and presented in its entirety in Appendix 2d.
4. **Research Methods coursework:** Nine credits of research methods under three categories (qualitative, quantitative, and advanced/ mixed) are required, but the courses that any given student could use to meet this requirement can and will vary. The revised proposal lists several example existing courses under each of the three categories on page 4 (line

26) through page 5 (line 11). It is not anticipated that the numbers of new students taking any one of these courses will be small, and should not exceed course enrollment limits. Faculty from several of the course offering departments have said that they welcome additional student numbers in their classrooms. Any additional courses proposed by the Department of Engineering Education to meet this requirement will, of course, seek concurrences from the appropriate colleges / departments, but none are proposed at this time.

5. **Qualifying exam:** Details about the qualifying exam are presented on page 6 (lines 31-40). The qualifying exam will be completed by students once they complete these three of the required core engineering education courses: ENGREDU 6100, 6200, and 7780. Qualifying exams will be administered twice a year, once in January and once in August. Students will have two weeks to answer and submit an electronic response to three questions, one based on each course. The graduate committee will be responsible for developing and assessing the responses. Students may receive a high pass, pass, or fail for each response. Students will have two attempts to receive at least a pass on each question. Students only have to retake questions they fail in their first attempt. If after their second attempt, a student does not receive at least a pass on all three questions, they will be dismissed from the program.
6. **Traditional Disciplinary Engineering coursework:** A more detailed description of the engineering coursework requirement is presented on page 6 (lines 6-25), including more information about the national professional licensing exam that can be used to show equivalence of an accredited undergraduate engineering degree. In the United States, engineers are licensed at the state level by professional licensing boards. Professional Engineering (P.E.) licensure candidates must meet a combination of requirements in education, experience, and exams. The first of the two major national exams, usually taken within six months of graduation from an accredited undergraduate program, is the Fundamentals of Engineering (FE) examination (NCEES, 2017). A few states will allow candidates with undergraduate degrees in non-engineering STEM fields to sit for these exams, if they can demonstrate appropriate on-the-job engineering experience.
7. **Student Funding:** More details about student funding are presented on page 15 (lines 5-8), page 16 (lines 7-22), and page 22 (lines 12-25). Graduate students will be supported by a combination of university and college fellowships, research grants, teaching assistantships, new faculty start-up allocations, and other departmental funding. The department's large teaching commitment, serving more than 3500 undergraduates annually, means that there is an assured pool of more than twenty graduate teaching assistantships (GTAs) available each year, although not all of these GTA positions will always be filled by engineering education doctoral students.
8. **Specializations:** This doctoral program is not proposing to create formal transcriptable specializations. All students are required to complete twelve hours of specialized coursework, but there is no expectation that any specializations will appear on the student transcript unless the student specifically chooses to draw upon existing OSU programs that are already noted on transcripts. This is described on pages 5 (line 13) through 6. (line 2).
9. **Masters degree:** One or more Masters' degrees will be developed over the next few years, but details have yet to be developed and thus cannot be included in this doctoral

proposal. A full Curriculum Development Institute, led by the University Center for the Advancement of Teaching, is planned for the summer of 2018 to work on engineering education masters programs.

10. **Administration:** More details about how the graduate program will be administered are described on pages 8 (line 28) through page 9 (line 9). The proposed doctoral program will be administered by the department's Graduate Studies Committee whose members include faculty and staff representing different areas within the department. It includes at least three faculty members with level-P status, the graduate program coordinator, and one graduate student representative. The chair of the Graduate Studies Committee is appointed by the department chair for a three-year term and also serves as a member of the College's Graduate Program Chairs Committee. The Graduate Studies Committee's responsibilities include all graduate curriculum matters related to the graduate courses offered by the department. The Committee will recruit and select prospective graduate students, recommend the award of fellowships and graduate teaching and research assistantships to incoming students, ensure that the graduate curriculum and the program graduate study rules are kept current, administer an annual review process for graduate students in the program, review course assessment reports from program directors, administer the graduate examinations required by the program and the Graduate School, and carry out any other charges related to graduate studies that may be requested by the department chair.
11. **Formatting:** The proposal has been reformatted to align with the required format for the eventual review by the Ohio Department of Higher Education.

Again, thank you for your thorough review and suggestions for improvement.

Sincerely,

A handwritten signature in black ink, appearing to read "Ann D. Christy". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Ann D. Christy, Ph.D., P.E.

Professor and Chair of the Graduate Studies Committee, Dept. of Engineering Education
Professor, Department of Food, Agricultural, and Biological Engineering
Assistant Dean of Teaching and Learning, College of Engineering

From: [Herness, Scott](#)
To: [Christy, Ann](#)
Cc: [Toft, Jill A.](#); [Herness, Scott](#)
Subject: RE: GS?CAA Curriculum subcommittee PhD Eng Ed
Date: Wednesday, June 14, 2017 10:38:23 AM
Attachments: [image002.png](#)

Ann,

Thanks for reaching out.

The proposal should be in the format initially described in the PDP section of the GUIDELINES: the ten section headers that are found on page 6. This will be true for both the PDP and the Full Proposal. Only the PDP has a page limitation. All that we do at the University level and the Full Proposal have no page limitations.

My earlier suggestion to you was to initially develop the proposal using these ten section headers so that you would not have to re-do it when preparing for ODHE submission. I understand that the GUIDELINES aren't crystal clear; that was supposed to be my job! It is easiest to develop the proposal (putting everything in it with no page limitation) in the required format; then you only task is to whittle it down to five pages for the single PDP step. The Full Proposal would then be ready for editing once PDP comments are received.

You can continue in the present format now, should you like. OR, you could do the inevitable re-formatting now. It doesn't matter; I just wanted to bring this to your attention since we will have to address it in the near future.

More questions? Just reach out.

Best,

Scott



Scott Herness

Interim Vice Provost for Graduate Studies
Interim Dean of the Graduate School

Graduate School

250 University Hall, 230 North Oval Mall Columbus, OH 43210-1366

614-247-7413 Office / 614-292-3656 Fax

herness.1@osu.edu

From: Christy, Ann
Sent: Tuesday, June 13, 2017 2:59 PM
To: Herness, Scott <herness.1@osu.edu>
Subject: Re: GS?CAA Curriculum subcommittee PhD Eng Ed

From: [Herness, Scott](#)
To: [Christy, Ann](#)
Cc: [Toft, Jill A.](#); [Herness, Scott](#)
Subject: GS?CAA Curriculum subcommittee PhD Eng Ed
Date: Saturday, June 10, 2017 11:03:04 AM
Attachments: [image002.png](#)

June 9, 2017

Ann Christy
Professor
Dept. Engineering Education
College of Engineering

PhD in Engineering Education

The combined Graduate School/Council on Academic Affairs curriculum subcommittee met on June 1st and, among its agenda items, considered the proposal to create a new PhD degree in Engineering Education. The degree, an 80 credit hour dissertation based doctorate, would be housed in the newly formed Department of Engineering Education in the College of Engineering. The subcommittee found the curriculum and assessment of the core courses to be exceptionally well developed and clearly narrated. However, they request clarification on a number of other points. These comments are provided in effort to strengthen the proposal prior to its subsequent review process including the required statewide review through the Ohio Department of Higher Education.

- A major question that arose concerned the nature of the scholarship students would pursue in completing their dissertation. At present, committee members questioned whether the intent is to produce a professional or a research doctorate, i.e. graduates who practice the profession (such as the Ed.D) or who contribute to the scholarship of the profession through original research (the PhD). The latter is assumed. The proposal details its core curriculum well yet the subsequent thirty research hours are not described. Elective courses may provide a preview into the types of expected dissertation topics, but descriptions are not extant. Examples of varying dissertation topics, the nature of the research projects, and integration into elective themes would be very helpful.
- Another significant concern regards the number of faculty who would be eligible to participate in the graduate program. To serve as a doctoral advisor, faculty will require "P" status from the Graduate School. At present, only five of the listed faculty would be eligible for "P" status. As a newly formed department, five additional faculty are promised. Is this a firm commitment and will these be P-eligible (i.e., tenure-track) hires? Also, will faculty from the College of Education and Human Ecology participate in the doctoral program? A better more explicit description of number of faculty

eligible to serve as advisors (P-status) and the projected enrollment (at one point up as high as 50 students per year) is required.

- A question arose as to how a student would be advised through the elective portion of the curriculum. It is assumed that these electives parallel the dissertation topic (as previously mentioned). Will there be a student advising sheet (look to CEHE for some excellent examples of doctoral student advising sheets)?
- Nine credits in research methods are required; however, no courses are listed. Please provide more detail for this portion of the curriculum. If these are pre-existing courses in other colleges/departments, then concurrences will be needed.
- Appendix 2C presents a qualifying exam at the end of the first year which is not mentioned in the proposal. Details of the proposal would be appreciated. For example, what material is covered in the exam? Who gives/grades the exam? What are the alternatives/consequences for the student who fails?
- Twelve credit hours in traditional engineering coursework at 5000 level or higher are required. The caveat is presented that some students (e.g., those with non-engineering STEM background) may need to enroll in engineering course work below the 5000 level. It is important to note that not all of this course work can count towards the PhD and this constraint should be transparent to the student. Further, a description of how students may test-out through *Fundamentals of Engineering (FE) Exam* (with which most committee members are unfamiliar) would be helpful.
- How students will be funded in the program could be more explicitly described. GA lines are mentioned in the proposal (21 GTAs on pg. 1; 32 GTAs on pg. 17) though it is uncertain if these lines will partially or completely be available to support students in this graduate program. Any detail on committed fiscal support for the program from the department or college would strengthen the proposal.
- Will the doctoral program create formal transcriptable specializations in the future?
- A Master's degree has been mentioned as a long-term goal. How would an embedded Master's degree be integrated into the doctoral program? In the future, would the program wish to admit to a Master's degree before progression to the doctorate or create an embedded Master's degree for post-candidacy students unable to adequately progress to the PhD? Either of these scenarios might best be considered within this proposal, rather than at a later date.
- There is no mention of the graduate program will be administered. How will the graduate studies committee be formed? How will the Graduate Studies Chair be chosen? Will the students have annual reviews by the committee?

Finally, I note for information purposes that the proposal is not in the required format for the eventual review by the Ohio Department of Higher Education (though an earlier draft was). I have, on previous occasions, shared this format with you. I mention this merely to inform you that, after Senate approval, the proposal will require re-formatting prior to statewide review.

Please consider the subcommittee's comments and submit a revised proposal with detailed responses to their concerns. As always, I am available for any questions or clarifications.

Following the successful review by the subcommittee, I will submit the proposal to the Graduate Council for their review followed by the Committee on Academic Affairs. The proposal will continue through the university approval process to the University Senate and the Board of Trustees. Additionally, following approval by the University Senate, I will submit the proposal to the Ohio Dept. of Higher Education (formerly the Ohio Board of Regents) for the required statewide review process.

Many thanks,



Scott Herness

Interim Vice Provost for Graduate Studies
Interim Dean of the Graduate School

Graduate School

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Greetings Scott:

Thank you for sharing these comments and suggestions for improving our proposal to establish a PhD in engineering education. My team is working on revisions of individual sections right now, but I wanted to ask you about the formatting comment before we send you our revised proposal. We used the 2015 CCGS guidelines for a full proposal (FP) as our formatting outline (pages 10- 12 of attached CCGS pdf file). Is there a newer set of formatting guidelines that we should follow? Or should we follow the guidelines for the PDP (page 8)?, however in that case, our document will be much longer than the 5 pages required for a PDP. Your advice will be much appreciated.

Best regards,
Ann



Ann D. Christy, Ph.D., P.E.

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Subject: GS?CAA Curriculum subcommittee PhD Eng Ed

June 9, 2017

Ann Christy
Professor
Dept. Engineering Education
College of Engineering

PhD in Engineering Education

The combined Graduate School/Council on Academic Affairs curriculum subcommittee met on June 1st and, among its agenda items, considered the proposal to create a new PhD

degree in Engineering Education. The degree, an 80 credit hour dissertation based doctorate, would be housed in the newly formed Department of Engineering Education in the College of Engineering. The subcommittee found the curriculum and assessment of the core courses to be exceptionally well developed and clearly narrated. However, they request clarification on a number of other points. These comments are provided in effort to strengthen the proposal prior to its subsequent review process including the required statewide review through the Ohio Department of Higher Education.

- A major question that arose concerned the nature of the scholarship students would pursue in completing their dissertation. At present, committee members questioned whether the intent is to produce a professional or a research doctorate, i.e. graduates who practice the profession (such as the Ed.D) or who contribute to the scholarship of the profession through original research (the PhD). The latter is assumed. The proposal details its core curriculum well yet the subsequent thirty research hours are not described. Elective courses may provide a preview into the types of expected dissertation topics, but descriptions are not extant. Examples of varying dissertation topics, the nature of the research projects, and integration into elective themes would be very helpful.
- Another significant concern regards the number of faculty who would be eligible to participate in the graduate program. To serve as a doctoral advisor, faculty will require "P" status from the Graduate School. At present, only five of the listed faculty would be eligible for "P" status. As a newly formed department, five additional faculty are promised. Is this a firm commitment and will these be P-eligible (i.e., tenure-track) hires? Also, will faculty from the College of Education and Human Ecology participate in the doctoral program? A better more explicit description of number of faculty eligible to serve as advisors (P-status) and the projected enrollment (at one point up as high as 50 students per year) is required.
- A question arose as to how a student would be advised through the elective portion of the curriculum. It is assumed that these electives parallel the dissertation topic (as previously mentioned). Will there be a student advising sheet (look to CEHE for some excellent examples of doctoral student advising sheets)?
- Nine credits in research methods are required; however, no courses are listed. Please provide more detail for this portion of the curriculum. If these are pre-existing courses in other colleges/departments, then concurrences will be needed.
- Appendix 2C presents a qualifying exam at the end of the first year which is not mentioned in the proposal. Details of the proposal would be appreciated. For example, what material is covered in the exam? Who gives/grades the exam? What are the alternatives/consequences for the student who fails?
- Twelve credit hours in traditional engineering coursework at 5000 level or higher are required. The caveat is presented that some students (e.g., those with non-engineering STEM background) may need to enroll in engineering course work below the 5000 level. It is important to note that not all of this course work can count towards the PhD and this constraint should be transparent to the student.

Further, a description of how students may test-out through *Fundamentals of Engineering (FE) Exam* (with which most committee members are unfamiliar) would be helpful.

- How students will be funded in the program could be more explicitly described. GA lines are mentioned in the proposal (21 GTAs on pg. 1; 32 GTAs on pg. 17) though it is uncertain if these lines will partially or completely be available to support students in this graduate program. Any detail on committed fiscal support for the program from the department or college would strengthen the proposal.
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Many thanks,





THE OHIO STATE UNIVERSITY

Scott Herness

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Proposal for the
establishment of a doctoral
graduate program

**Ph.D. in
Engineering Education**

Contact:

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Sept. 5, 2017

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THE OHIO STATE UNIVERSITY

COLLEGE OF ENGINEERING

eed.osu.edu

Proposal for Ph.D. Engineering Education, OSU College of Engineering

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Proposal for Ph.D. Engineering Education, College of Engineering

1. *Designation of the new degree program, rationale for that designation, definition of the focus of the program, and a brief description of its disciplinary purpose and significance*

a. Designation. The Department of Engineering Education within the College of Engineering proposes to establish a Ph.D. in Engineering Education as its terminal degree. The proposed degree program is an entry-level, interdisciplinary research program that combines both disciplines of engineering and education.

b. Rationale. The Department of Engineering Education (EED) has emerged from the former Engineering Education Innovation Center after more than 15 years of effort developing and delivering college-wide undergraduate programs originating from a \$13M 1992-2003 NSF Coalition Grant. The EED was formed to expand The Ohio State University’s (OSU’s) well-regarded work in engineering education research, building upon already strong scholarship of teaching and learning within our classrooms. The formation of the department in 2015 allowed us to hire tenure-track faculty to further build an engineering education research endeavor. It is this research platform that will develop and support graduate students in our proposed Ph.D. program.

c. Definition of focus. The overall goals for this proposed Ph.D. program are that the successful engineering education doctoral graduate will be able to:

- Identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs,
- Design, conduct, and critique research in engineering education,
- Demonstrate, value, and apply engineering expertise,
- Create, teach, and assess courses and curricula in engineering, and
- Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits.

d. Description of disciplinary purpose. To meet current and future global needs, OSU is committed to achieving eminence in both research and teaching. Within the College of Engineering, reaching this eminence goal relies upon attracting and retaining a diverse, highly talented pool of engineering educators and researchers; on developing and delivering evidence-based, significant learning experiences to undergraduate and graduate engineering students; recruiting and graduating high quality graduate students, disseminating our work to others in the engineering and engineering education communities; and on launching new professionals in

1 possession of strong disciplinary knowledge in engineering and similarly strong
2 multidisciplinary general education.

3 e. **Description of significance.** The following section is organized to specifically
4 address four of the evaluation criteria listed in the Ohio Department of Higher
5 Education's Chancellor's Council on Graduate Studies (CCGS) Guidelines and
6 Procedures for Review and Approval of Graduate Degree Programs (2015, p.8).
7 The bolded subheadings below are derived directly from that document. Other
8 CCGS criteria are specifically addressed in Sections 2, 3, and 8 of this proposal.

9 i. **Description of program differences (conceptual and qualitative) from**
10 **undergraduate engineering education (or related) programs.** The program
11 is distinctly different, both conceptually and qualitatively, from the one
12 undergraduate degree program at Ohio Northern University (ONU) in the
13 same discipline due to its focus on research and the application of engineering
14 education theories to a wider breadth of learning settings including higher
15 education, K-12, industry, nonprofits, and government. The program at ONU
16 is unique being the only undergraduate degree in engineering education in the
17 country. Our proposed program is similar to other engineering education
18 graduate programs in that many of the formal programs house first-year
19 engineering curricula and confer graduate degrees in engineering education-
20 related areas. The proposed program is different from those graduate
21 programs in its emphasis on specializations and career goals beyond higher
22 education.

23 ii. **Program emphasizes the theoretical basis of Engineering Education**
24 **expressed in methods of inquiry and ways of knowing.** As a disciplinary
25 education field, the theoretical basis for engineering education has much in
26 common with other disciplinary based educational research. Foundations
27 include learning theory, cognitive sciences, and organizational change theory
28 (Froyd and Lohmann, 2014). Other researchers suggest that the three
29 conceptual frameworks of behaviorism, cognitivism, and situativity are
30 commonly used for designing rigorous engineering education research
31 investigations (Newstetter and Svinicki, 2014). Methods of inquiry range from
32 the quantitative methods in which most engineering faculty are well trained, to
33 the qualitative and mixed methods more common in social science and
34 educational research literature. Engineering education, as a discipline, bridges
35 all three of these research approaches (Johri and Olds, 2014). The proposed
36 curriculum allows students to explore these theories and methods in core
37 courses (ENGREDU 6100, 6200, and 7780) with an additional nine hours of
38 research methods (quantitative, qualitative, and advanced / mixed methods)
39 which will be taken in departments across the university.

40 iii. **Program emphasizes professional decision making and teaches use of**
41 **critical analysis in problem solving.** The nature of graduate education aligns
42 with such decision making and critical analysis. The proposed engineering
43 education courses will include higher-order thinking and reflective elements
44 including an annual review administered by the graduate studies committee

1 which will allow students to synthesize content across courses and apply
2 engineering learning mechanisms and approaches to engineering practice.

- 3 **iv. Program educates students broadly.** The program is designed to educate
4 students broadly so that they have an understanding of the major issues and
5 concerns in the engineering education discipline or professional area. Several
6 of the program learning outcomes address this specifically. The curricular
7 map in Appendix 2b identifies where and at what level of proficiency
8 (beginning, intermediate, and advanced) in the curriculum students will
9 engage with major issues in the discipline. The twelve credit hours of
10 coursework within an individual specialization also adds to the breadth of the
11 students' education.

12 **2. Description of proposed curriculum.**

13 The proposed degree is a research doctorate which will require a minimum of 80 credits
14 beyond the Bachelor's degree (which may include up to 30 hours of transfer credit beyond
15 the Bachelor's degree) with a program of study approved by the student's advisory
16 committee. The total number of credit hours required is aligned with other Ph.D. programs
17 in OSU's College of Engineering.

18 This proposed Ph.D. in engineering education requires more coursework (50 credit hours)
19 than dissertation research (30 credit hours). In traditional Ph.D. programs in disciplinary
20 engineering fields (e.g., civil engineering, mechanical engineering), the opposite is usually
21 true. However, our credit hour balance is aligned with other engineering education Ph.D.
22 programs in the U.S. For example, benchmark programs at Purdue University (42
23 coursework credits and 32 dissertation research credits) and Virginia Tech (48 coursework
24 credits and 30 dissertation research credits) have a similar balance. This difference relative
25 to disciplinary engineering is mainly due to the number of education research focused
26 courses students are required to take in engineering education programs that are not
27 required in traditional Ph.D. programs in engineering. In our program, students will be
28 required to take 12 credits of coursework specifically focused on research methods (three
29 within the department and nine outside of the department).

30 In conjunction with this proposal to establish a new degree program, the department
31 requests approval of a new Course Catalogue Designation of ENGREDU for all graduate
32 courses offered by the department. As a new degree program in a new department, a new
33 course catalog designation will help distinguish our courses from those of other
34 departments on student transcripts and within the course catalog. This particular name,
35 ENGREDU, is proposed as a good way to avoid confusion with English (abbreviated as
36 ENG in some places), and our own undergraduate general engineering courses (designated
37 ENGR) which serve the entire College of Engineering while still showing the close tie
38 between our unit's undergraduate and graduate course offerings.

39 Appendix 2 contains curricular details including the program learning outcomes which
40 support the five program goals and descriptions of three specific levels of proficiency (e.g.,
41 beginning, intermediate, and advanced, see Appendix 2a) for each learning outcome. This
42 describes what students will be expected to do to demonstrate beginning, intermediate, and
43 advanced levels of proficiency for each outcome. Appendix 2b presents how the levels of

1 proficiency for each of the program learning outcomes are mapped onto the required
2 courses and other program elements. The department gratefully acknowledges the wisdom,
3 guidance, and facilitation provided by the University Center for the Advancement of
4 Teaching in developing this curriculum, and thanks Drs. Alan L. Kalish and Teresa A.
5 Johnson for working with the proposal writing team as a learning community through all
6 aspects of curriculum design and assessment planning.

7 A summary of a typical program includes:

8 • **Seventeen credits of required core engineering education coursework** (Note: syllabi
9 for these core courses are included in Appendix 3):

- 10 ○ ENGREDU 6100: Foundations and the Field of Engineering Education (three
11 credits)
- 12 ○ ENGREDU 6200: Learning Theory, Pedagogy, and Assessment (three credits)
- 13 ○ ENGREDU 7189.01: Engineering Education Practicum I (two credits, must be
14 taken in the same term as the start of a significant two-semester teaching
15 experience)
- 16 ○ ENGREDU 7189.02: Engineering Education Practicum II (one credit, must be
17 taken in the same term as the second semester of a significant two-semester
18 teaching experience)
- 19 ○ ENGREDU 7780: Engineering Education Research Methods (three credits)
- 20 ○ ENGREDU 7881: Seminar in Engineering Education (one credit each semester
21 with a requirement of two total to count toward the degree with expectation that
22 students will participate each semester of enrollment unless there are schedule
23 conflicts)
- 24 ○ ENGREDU 7900: Professional Development in Engineering Education (three
25 credits)

26 • **Nine credits in research methods** through courses that support the student's research

- 27 ○ Three credits of quantitative research methods that includes an emphasis on
28 statistics, including but not limited to the following existing OSU courses:
 - 29 • STAT 5510: Statistical Foundations of Survey Research
 - 30 • STAT 6410: Design and Analysis of Experiments
 - 31 • ESQREM 6641: Introduction to Educational Statistics
 - 32 • ESQREM 6661: Introduction to Educational Measurement
 - 33 • AEE 8860: Research Design
- 34 ○ Three credits of qualitative research methods, including but not limited to the
35 following existing OSU courses:
 - 36 • ESHESA 7256: Qualitative Research in Higher Educational Settings

- 1 • EDUTL 8001: Discourse Analysis and Educational Research I
- 2 • EDUTL 8002: Discourse Analysis and Educational Research II
- 3 • ESQRE 8280: Qualitative Research in Education: Paradigms, Theories, and
- 4 Exemplars

- 5 ○ Three credits of advanced / mixed research methods, including but not limited to the
- 6 following existing OSU courses:
- 7 • ESQREM 7635: Advanced Research Methods
- 8 • EDUTL 7749 Concept Inventories in STEM Education
- 9 • ESQRE 8290: Qualitative Research in Education: Methods and Analysis
- 10 • EDUTL 8751: Survey and Critical Analysis of Research in STEM
- 11 Education

- 12 • **Twelve credits of specialization elective coursework** through approved courses that
- 13 support the student's research focus and future career goals to include:
- 14 ○ Three credits minimum within the Department of Engineering Education
- 15 ○ Three credits minimum outside the Department of Engineering Education
- 16 ○ A coherent course of study in the student's chosen area of specialization. Each
- 17 faculty advisor will work with their students to together define the specialization
- 18 focus for each student's coursework, based on student needs and faculty interests.
- 19 Further categorization will be developed among the emergent individual
- 20 specializations. It is not intended that any specializations will appear on the student
- 21 transcript unless the student specifically chooses to draw upon existing OSU
- 22 programs that are already noted on transcripts. Some examples (many of which are
- 23 transcriptable) include:
- 24 ▪ Adult education / Business human resource development
- 25 ▪ African American and African studies (transcriptable OSU graduate minor)
- 26 ▪ Applied developmental science in education (transcriptable OSU
- 27 interdisciplinary specialization)
- 28 ▪ College and university teaching (transcriptable OSU interdisciplinary
- 29 specialization)
- 30 ▪ Disability studies (transcriptable OSU interdisciplinary specialization)
- 31 ▪ Engineering technical communications
- 32 ▪ Humanitarian engineering
- 33 ▪ Inter-professional studies (transcriptable OSU interdisciplinary
- 34 specialization)
- 35 ▪ Latino/a studies (transcriptable OSU interdisciplinary specialization)
- 36 ▪ Neuroscience (transcriptable OSU graduate minor)
- 37 ▪ Nonprofit studies (transcriptable OSU graduate minor)
- 38 ▪ Public policy and management (transcriptable OSU graduate minor)
- 39 ▪ Sexuality studies (transcriptable OSU interdisciplinary specialization)
- 40 ▪ Statistics and statistical data analysis (transcriptable OSU graduate minor)

- 1 ▪ Survey research (transcriptable OSU interdisciplinary specialization)
- 2 ▪ Women's, gender, and sexuality studies (transcriptable OSU graduate minor)
- 3 • **Twelve credits in traditional engineering coursework** at the 5000 level or higher*
- 4 • **Thirty credits of dissertation research** (ENGREDU 8999 or other approved 8999
- 5 course)

6 * *Ph.D. candidates with an undergraduate degree in non-engineering STEM*
7 *fields (e.g., math, physics or chemistry) are generally required to take two to*
8 *five undergraduate courses in a selected traditional engineering discipline,*
9 *including a significant engineering design experience, to adequately prepare*
10 *them for graduate level courses at the 5000 or higher level. Students must*
11 *receive approval for these courses from a potential faculty advisor. Not all of*
12 *this course work can count towards the PhD degree, and this constraint will be*
13 *made transparent to students who are in this situation.*

14 *Alternatively, students may demonstrate their engineering proficiency, and thus their*
15 *eligibility to enroll in graduate-level engineering coursework, through successful*
16 *completion of the Fundamentals of Engineering (FE) examination (NCEES, 2017) and*
17 *demonstrated completion of a significant engineering design experience. In the United*
18 *States, engineers are licensed at the state level by professional licensing boards.*
19 *Professional Engineering (P.E.) licensure candidates must meet a combination of*
20 *requirements in education, experience, and exams. The first of the two major national*
21 *exams, usually taken within six months of graduation from an accredited*
22 *undergraduate program, is the Fundamentals of Engineering (FE) examination*
23 *(NCEES, 2017). A few states will allow candidates with undergraduate degrees in*
24 *non-engineering STEM fields to sit for these exams, if they can demonstrate*
25 *appropriate on-the-job engineering experience.*

26 All students in the Ph.D. in engineering education program will complete three exams:
27 qualifying exam, candidacy exam, and final defense. The qualifying exam will be
28 administered by the graduate committee and is detailed below. The candidacy exam and
29 the final defense will be administered by the advisor and the student's dissertation
30 committee in accordance with graduate school policies.

31 The qualifying exam will be completed by students once they complete three of the
32 required core engineering education courses: ENGREDU 6100, 6200, and 7780.
33 Qualifying exams will be administered twice a year, once in January and once in August.
34 Students will have two weeks to answer and submit an electronic response to three
35 questions, one based on each course. The graduate committee will be responsible for
36 developing and assessing the responses. Students may receive a high pass, pass, or fail for
37 each response. Students will have two attempts to receive at least a pass on each question.
38 Students only have to retake questions they fail in their first attempt. If after their second
39 attempt, a student does not received at least a pass on all three questions, they will be
40 dismissed from the program.

41 Appendix 2c presents a typical course of study on a semester-by-semester basis for an
42 admitted student who already has earned a Bachelor's degree in an engineering discipline

1 and for one who enters having already earned a Master's degree in an engineering
2 discipline. A student advising sheet (Appendix 2d) will be completed during conversations
3 between the student and faculty advisor to map out an individualized curriculum that serves
4 the student's aspirations and equips them to perform their chosen engineering education
5 dissertation research while meeting all program requirements. The advising sheet serves as
6 an agenda for a student's plan of study while enrolled in the Ph.D. program, listing core
7 requirements, elective courses, research methods and practicum courses, and details about
8 the candidacy exam and dissertation research.

9 Students with non-STEM undergraduate degrees are advised to take courses equivalent to
10 Ohio State's core undergraduate engineering program before applying for admission to the
11 graduate program. For additional information, students will be directed to consult with the
12 Graduate Studies Chair.

13 **How curriculum develops competence in Engineering Education.** The program goals
14 and learning outcomes (Appendix 2a) describe what this department's faculty considers
15 competence in engineering education. The curricular map (Appendix 2b) indicates the
16 levels of proficiency in each of the learning outcomes that students are expected to achieve
17 and where evaluations of proficiency will occur. Assessment of these learning outcomes
18 within course assignments and during students' annual reviews will provide ongoing
19 feedback on students' developing competence in engineering education. Appendix 4
20 presents the proposed assessment plan as entered in OSU's online institution-wide
21 assessment tracking tool, TracDat.

22 **Plans for professional accreditation including core courses.** Professional engineering
23 accreditation (ABET, 2017) is typically tied to the undergraduate degree, not any
24 subsequent graduate degree. However, an external review of courses will be conducted by
25 professionals in the engineering education community via a departmental advisory board.

26 **3. *Description of required culminating degree, or integrated learning, experience.***

27 The required culminating experience of this Ph.D. program is a doctoral dissertation in an
28 individual area of engineering education designed by the student and his/her advisor and
29 graduate advisory committee. Students, in collaboration with their advisor and
30 committee, design and complete a research project or series of projects that leads to the
31 writing and successful defense of the dissertation.

32 Expected topics for dissertation research range from diversity and inclusion in the
33 engineering classroom and professional engineering workforce to pedagogies and
34 assessment methods to improve engineering education in the university environment.
35 Departmental faculty currently are conducting and collaborating on research in the
36 following areas as listed on the webpage <eed.osu.edu>:

- 37 • Boundary Spanning with Engineering Education and Community Engagement - Delaine
- 38 • Development and Validation of Assessments for Industry-Valued Professional and
39 Technical Learning Outcomes in Engineering Education - Rogers
- 40 • Development of Empathy within student participants of Community Engagement - Delaine
- 41 • Engineering Education for Students with Visual Impairments (EEVI) Project - Grzybowski
- 42 • Engineering is Elementary - Ohio - Kajfez
- 43 • Grading Training of Technical Writing Assignments in 1st-Year Engineering - Kecskemety

- 1 • Implementing an Open-Ended Game Software Design Project in First-Year Engineering -
2 Kecskemety
- 3 • International design projects linking study abroad and capstone courses - Christy
- 4 • More than recruitment and outreach: Diversity and inclusion in engineering
5 education curricula and classrooms - Kuzawa
- 6 • Professional development for undergraduate engineering students - Christy
- 7 • Service learning and real-world client-centered student design projects - Christy
- 8 • smART: ART Integrated Formal and Informal STEAM Education - Grzybowski
- 9 • Student Perspectives on Researcher Identity and Transformed Epistemologies (SPRITE) -
10 Kajfez
- 11 • Writing as knowing: Creative knowing through multiple messaging modes in
12 an engineering technical communications course – Kuzawa

13
14 Many of these topics lend themselves well to integration with themes in specialization
15 elective coursework. It is anticipated that this list of research topics will expand as more
16 faculty join the department and current faculty grow their expertise. Another indicator of
17 potential research topics in the field of engineering education is presented in Appendix 2e
18 which lists ten years of dissertation titles from the two largest and oldest engineering
19 education programs in the US: Purdue University's School of Engineering Education and
20 Virginia Tech's Department of Engineering Education. While most of this research has
21 occurred within higher education settings, we anticipate that our graduates will be able to
22 conduct research in nonacademic settings as well.

23 Procedures for dissertation examination follow the guidelines of the Graduate School
24 where final approval of the dissertation entails formal committee review and approval of
25 a written document and successful completion of a final oral examination. Final approval
26 of the written dissertation is required for graduation.

27
28 ***4. Administrative arrangements for the proposed program: department and school or***
29 ***college involved.***
30

31 The engineering education Ph.D. program resides within the Department of Engineering
32 Education which is within the College of Engineering at OSU. The proposed doctoral
33 program will be administered by the department's Graduate Studies Committee whose
34 members include faculty and staff representing different areas within the department. The
35 composition of the committee is designed so that areas of the department graduate
36 curriculum offerings are fairly represented. It also includes at least three faculty members
37 with level-P status, the graduate program coordinator, and one graduate student
38 representative. The chair of the Graduate Studies Committee is appointed by the department
39 chair for a three-year term and also serves as a member of the College's Graduate Program
40 Chairs Committee. The appointments of the faculty and staff members on the Graduate
41 Studies Committee are for three years, and individual appointments are staggered. The
42 student representative will be selected from among the engineering education graduate
43 students for a rotating one-year term.

44

1 The Graduate Studies Committee's responsibilities include all graduate curriculum matters
2 related to the graduate courses offered by the department. The Committee will recruit and
3 select prospective graduate students, recommend the award of fellowships and graduate
4 teaching and research assistantships to incoming students, ensure that the graduate
5 curriculum and the program graduate study rules are kept current, administer an annual
6 review process for graduate students in the program, review course assessment reports from
7 program directors, administer the graduate examinations required by the program and the
8 Graduate School, and carry out any other charges related to graduate studies that may be
9 requested by the department chair.

10
11 **5. *Evidence of the need for the new degree program, including opportunities for***
12 ***employment of graduates. Address other similar programs in the state.***

13 **Institutional support for this new degree program.** OSU currently offers over 90
14 doctoral programs, most recently adding new Ph.D. programs in Italian and Portuguese in
15 2012. According to the Graduate School Strategic Plan (Osmer, 2010, p.2-3), their main
16 strategies include the following:

- 17 • Increase the national and international visibility of the graduate programs at Ohio State
- 18 • Enhance Ohio State's visibility and reputation in interdisciplinary research
- 19 • Develop a strategic communication plan to convey the importance of graduate
20 education to on-campus, state, and broader audiences

21 The same strategic plan states "Traditionally, knowledge advanced within disciplines, and
22 the curriculum was organized within discipline-based departments. However, we now see
23 knowledge advancing not only within the core of the various disciplines but increasingly
24 on the interface of disciplines and through new combinations of disciplines. Ohio State not
25 only has an opportunity but also has the responsibility to fully engage in a next phase of
26 knowledge generation, one that is more interdisciplinary and more cross-disciplinary than
27 has previously been undertaken." (Osmer, 2010, p. 7-9). This proposed Ph.D. program in
28 engineering education is an excellent example of an emergent cross-discipline area of
29 study, combining the fields of engineering and education.

30 Acknowledging the decentralized nature of graduate education, the strategic plan notes that
31 the Graduate School "does not develop new programs of its own accord. The role of the
32 Graduate School is in working with academic departments in providing data, information
33 and support that will be assistive to the departments as they determine how to expand
34 program opportunities." (Osmer, 2010, p.14). Thus there is no university-level plan for
35 overall development of graduate programs, but rather a plan for facilitating and
36 empowering faculty to develop programs in alignment with their own college and
37 departmental goals.

38 Ohio State College of Engineering's strategic objectives (October 2014) include several
39 that are directly related to this proposal:

- 40 • "Build on our strength in experiential learning to establish national leadership in this area

1 for Ohio State.

- 2 • Transform the Engineering Education Innovation Center (EEIC) to a formal
- 3 administrative unit within the college.
- 4 • Partner across the university to bring forward new academic programs, such as...
- 5 integrated business and engineering that prepare graduates for modern professional
- 6 practice."

7

8 **Societal demand including intellectual development, advancement of the discipline,**

9 **and employment opportunities.** The field of engineering education has roots in formal

10 research dating back over 100 years (Borrega and Bernhard, 2011; Froyd et al., 2012).

11 Over the past twenty years, the field has seen accelerated growth (Froyd and Lohmann,

12 2014). Engineering education, like other discipline-specific education fields (Fensham,

13 2004; Coppola, 2011), grew out of the subject matter discipline, in this case engineering,

14 not education. Various professional structures have been developed to support the new

15 domain including discipline-specific conceptual and theoretical development, research

16 methodologies, academic recognition, high-status research journals (e.g., the *Journal of*

17 *Engineering Education*, *Advances in Engineering Education*, *International Journal of*

18 *Engineering Education*, and the *European Journal of Engineering Education*), professional

19 associations and conferences, prestigious grant programs, seminal publications, and

20 scholarly outcomes applicable to the practice of engineering education.

21 Five years before the Department of Engineering Education was formed, its predecessor,

22 the Engineering Education Innovation Center, collaborated with the College of Education

23 and Human Ecology to offer a Ph.D. degree in STEM Education with a specialization in

24 Engineering Education. Now a department, the unit continues to develop additional courses

25 to expand the engineering-specific course offerings for the STEM Ph.D. program. The

26 current STEM doctoral program has graduated 15 students including three engineers. One

27 is currently a post-doctoral researcher, one is a tenure-track Assistant Professor at Embry-

28 Riddle Aeronautical University, and the third just accepted a lecturer position at Penn State

29 Behrend. This new proposed Ph.D. program is solely focused on engineering education,

30 providing a distinct but complementary alternative to the existing STEM education

31 program.

32 Employment opportunities for engineering education graduates are growing. Over the past

33 few years, several academic positions within engineering education have been posted and

34 filled. This trend is increasing as more universities consider engineering education-trained

35 hires within traditional technical engineering departments, joint hires between education

36 and engineering departments, and the development of engineering education institutes,

37 centers, schools, and departments. Within the tech industry, several companies have hired

38 Chief Learning Officers. A Chief Learning Officer is the highest-ranking corporate officer

39 in charge of learning management for employees and clients. Successful candidates for

40 these positions are experts in corporate training and instructional design, with degrees in

41 education, engineering, and/or business. Foundations, non-profits, and informal

42 educational institutions are also hiring professionals with an engineering education

43 background.

1 Some job postings listed over the 2016-2017 academic year hiring cycle include:

- 2 • [Arizona State University](#) – The Polytechnic School of the Ira A. Fulton Schools of
3 Engineering – Engineering Education
- 4 • [University of Cincinnati](#) – Department of Engineering Education
- 5 • [University of Michigan](#) – College of Engineering – Engineering Education
- 6 • [North Carolina State University](#) - Leadership in Public Science (Natural or Social
7 Sciences) position
- 8 • [Florida International University](#) – STEM Transformation Institute
- 9 • [University of Texas at Austin](#) – STEM Education Program – Engineering Education
- 10 • [University of Georgia](#) – College of Engineering – Engineering Education
- 11 • [The College of New Jersey](#) - The Department of Technological Studies in the School of
12 Engineering – Engineering Education
- 13 • [University of Colorado – Boulder](#) – ATLAS Institute - Creative Technologies and
14 Design
- 15 • [University of San Diego](#) - Shiley-Marcos School of Engineering – Engineering
16 Education
- 17 • [Rowan University](#) – Henry M. Rowan College of Engineering – Electrical Engineering

18
19 Many sites function as portals pertinent to job opportunities within the field of engineering
20 education:

- 21 • PBWorks Engineering Education Job Postings:
22 <http://engineeringeducationlist.pbworks.com/w/page/48108151/Engineering%20Education%20Job%20Postings>
23
- 24 • The Chronicle of higher Education: https://chroniclevitae.com/job_search/new
- 25 • Higher Ed Jobs: <https://www.higheredjobs.com/>
- 26 • EDSurge: <https://www.edsurge.com/jobs/>

27
28 **Scope including local, regional, national, and international need.** OSU’s Department of
29 Engineering Education will contribute to local, regional, national, and international needs
30 through research and practice within the field of engineering education. The grand
31 challenges of the 21st century (NAE, 2008) alongside the emergent needs of the global,
32 knowledge economy (Burton-Jones, 2011) require that engineering education be more
33 closely aligned with societal needs and more agile in its ability to respond to emerging
34 challenges. A “knowledge economy” employs knowledge as the key engine of competitive
35 growth, where knowledge is acquired, created, disseminated, and used effectively to
36 enhance economic development. Knowledge-enabled economies must be able to constantly

1 modernize their education systems in line with changes in economic realities. These
2 changes must be both systemic and deep, affecting the nature of teaching and learning. As
3 more economies shift towards knowledge-intensive directions, the demand for professional
4 skills and competencies increases significantly.

5
6 The nature of these challenges and the continued pace of technological advancement make
7 it imperative that technical knowledge be supplemented with professional skills to develop
8 an “adaptive engineering leader” who is capable of addressing the multiple challenges of an
9 ever-changing world (GEDC, 2010). The field of engineering education and the
10 Department of Engineering Education will respond to these challenges to develop the
11 engineering education professional required by globalized economies.

12
13 Engineering education has established a strong position with academic structures within the
14 United States and beyond. Worldwide, there are thirty-three institutions that specifically
15 offer engineering/STEM education graduate programs (ASEE-SD & CELT, 2017), of
16 which eight are international including locations in Canada, Denmark, Malaysia, Mexico,
17 and Sweden. As the field continues to develop, more opportunities to partner and
18 collaborate both with domestic and international institutions will emerge, providing further
19 ability for national and global impact.

20
21 A survey (Appendix 4) was developed to gather input from potential and future students to
22 help establish this as a student-centered engineering education doctoral program and
23 curriculum. Results can help inform program formation and continuous quality
24 improvement, as well as focus recruiting efforts.

25
26 **Programs available in other institutions.** Currently in the State of Ohio, there are no other
27 institutions that offer a Ph.D. in Engineering Education. Worldwide, there exists thirty-
28 three institutions that specifically offer engineering/STEM education graduate programs
29 (ASEE-SD & CELT, 2017). Two Ohio institutions appear on this list -- The Ohio State
30 University and University of Cincinnati -- but neither currently has an engineering
31 education doctoral program. We recently learned that the University of Cincinnati is
32 considering proposing a graduate degree in engineering education in the near future.
33 Although not a graduate program, Ohio Northern University has a new B.S. in Engineering
34 Education program which was described earlier in this document that could provide
35 another potential pathway into OSU's proposed Ph.D. program. As of this writing, OSU's
36 Ph.D. in Engineering Education would be the first in the state.

37 While Ohio does not have a Ph.D. in Engineering Education, both Purdue University and
38 Virginia Tech offer these degrees and are geographically close to OSU. Their programs
39 are growing and are currently attracting Ohio students since we do not offer such a degree
40 in Ohio. Additionally, the University of Michigan has recently received approval to offer a
41 Ph.D. in the field and is accepting applications.

42 Nationally, the first department of engineering education was established at Purdue
43 University in 2004, and Virginia Tech followed soon thereafter. A recent unpublished study
44 (Cox, 2016) of these two doctoral programs reports that the majority of graduates from
45 both institutions are employed in higher education. From data collected in late 2015, 85%

1 of all Purdue and 75% of all Virginia Tech engineering education graduates work in higher
2 education environments. Other employment includes industry (four graduates), nonprofit
3 organizations (three graduates), government (three graduates), and K-12 education (one
4 graduate).

5 Outside of engineering education specifically, there are STEM Ph.D. programs in the state
6 including one in the College of Education and Human Ecology at OSU. However, these
7 degree programs tend to focus on K-12 education in the science and math fields. The
8 program at OSU has that focus. While some engineering education graduates may work
9 and research in the K-12 space, most have interests that extend well beyond that landscape.
10 While many OSU Department of Engineering Education faculty partner with colleagues in
11 the College of Education and Human Ecology (several of whom have been offered
12 courtesy appointments in the new engineering education department), there exists a need to
13 create an independent graduate program focused on much broader areas of engineering
14 education.

15 **Appropriateness of specific locale for the program.** As the land grant institution for the
16 State of Ohio, the Ohio State University is well positioned to support this program so that it
17 can impact Columbus and the entire state. Being situated in central Ohio allows us to more
18 easily reach out to the entire state and also allows us to capitalize on the resources offered
19 in the state capital including the presence of the Ohio Department of Higher Education, the
20 Ohio Department of Education, and the State Board of Registration for Professional
21 Engineers and Surveyors.

22 Additionally, as a large research university with an established College of Engineering,
23 OSU is well situated to support this discipline-specific education program. At OSU, there
24 are 14 undergraduate engineering degree programs and 9 graduate engineering programs.
25 In the 2014-2015 academic year, OSU's College of Engineering graduated 1486
26 undergraduate students and 641 graduate students (COE, 2016). This proposed
27 engineering education doctoral program would create a strategic complement to the
28 traditional technical engineering work already being completed in the College.

29 **Opportunities for inter-institutional collaboration.** Due to the small nature of
30 engineering education as a discipline, there are many opportunities for inter-institutional
31 collaboration across the nation between the various engineering education departments.
32 Currently many of our faculty are collaborating with other institutions and industry partners
33 on research (See CVs in Appendix 1). There are also many opportunities for collaborations
34 with traditional departments in colleges of engineering in Ohio and beyond.

35 As an example of an inter-institutional collaboration across the state, OSU established a
36 group called Ohio Research for Engineering Education (OREE). This group met monthly
37 via teleconference to discuss items related to engineering education research. During its last
38 iteration, OSU, Ohio Northern, University of Cincinnati, Youngstown State, and Cleveland
39 State were represented in the group. We believe that OREE will be a place for researchers
40 across the state to come together to develop inter-institutional collaborations on a variety of
41 topics related to engineering education that will help the field and our proposed Ph.D.
42 program.

43

1 **6. *Prospective enrollment.***

2 It is expected that the majority of students entering into the proposed Ph.D. program will
 3 have a Bachelor's degree in an engineering discipline. Some may enter with a Master's
 4 degree in engineering. Having entered the Ph.D. in engineering education program with
 5 an engineering skillset already in place, these students will be able to succeed in the
 6 program while gaining an in-depth understanding of the educational aspects of
 7 engineering education. Additionally, Ph.D. candidates with an undergraduate degree in a
 8 science, technology, engineering, and mathematics (STEM) or other non-engineering field
 9 are expected to apply to the program. Additional engineering coursework will be required
 10 for students entering with non-engineering undergraduate degrees.

11 An interesting subset of students will be those with an undergraduate degree in
 12 engineering education, currently available at only a few institutions, including one located
 13 in Ohio (Ohio Northern University). These students will have already experienced
 14 engineering education as a field but with a K-12 focus. Ohio Northern's B.S. in
 15 engineering education program is accredited under Accreditation Board for Engineering
 16 and Technology's (ABET) general engineering criteria (ABET, 2017) and students are
 17 licensed to teach high school math.

18 We plan to attract Ph.D. students to support our growing research programs with the
 19 short-term goal of at least three Ph.D. student advisees per tenure-track faculty. These
 20 students will be supported fiscally on sponsored research grants and by shifting some of
 21 our department's 22 existing graduate teaching assistant (GTA) lines from students
 22 pursuing other engineering graduate degrees to engineering education students. There
 23 exists growing demand for graduates of doctoral engineering education programs. The job
 24 market for engineering education graduates includes universities, colleges, community
 25 colleges, and technical colleges (both in tenure-track and clinical faculty appointments),
 26 corporate training organizations, and high schools challenged with incorporating STEM
 27 initiatives and engineering design into core science standards. Approximately 75 students
 28 have obtained formal degrees in engineering education across the United States through
 29 2015. Numerous others have obtained engineering education-related degrees in Colleges
 30 such as Engineering, Education, and Public Policy.

- 31 **a. Potential enrollment.** The proposed Ph.D. program plans to attract 10-20 highly
 32 talented prospective students each academic year, plus another 20-30 graduate
 33 interdisciplinary specialization (i.e., cross-college graduate minor) students.
 34 Through identification of undergraduate pipelines in areas such as engineering,
 35 sciences, and STEM education as well as working professionals who want to shift
 36 their career focus (e.g., industry engineers, high school science teachers), we will
 37 create opportunities to engage these students while simultaneously being responsive
 38 and timely to all incoming inquiries. Travel and prospective student engagement is
 39 also planned at additional events like the Big Ten+ Graduate Engineering Expo
 40 held annually at Purdue University.

41 To meet prospective students where they are and to increase the exposure of the
 42 Department of Engineering Education's graduate program and its faculty to a
 43 broader audience, messaging will be tailored via increased social media presence
 44 (Barnes and Jacobson, 2013). Being proactive through outreach and interaction in

1 real time can be facilitated by technology (e.g., webinars and teleconferences)
 2 which has been proven integral to reaching audiences who might not live in the
 3 vicinity of the university (Breihan, 2007). Additionally, online information sessions
 4 where frequently asked questions can be asked and answered will be implemented
 5 with resulting FAQs posted on the departmental website. Funding is integral to
 6 recruitment, and the department is committed to identifying funding early, while
 7 continuing communication to the applicants about the status of their applications,
 8 the program, and new opportunities for engagement.

9 **b. Ability to maintain the critical mass of students.** The Department of Engineering
 10 Education is responsible for courses enrolling over 3500 undergraduate engineering
 11 students at Ohio State. For 2016-2017, the department hired 22 graduate and 168
 12 undergraduate teaching assistants to support this large teaching program. This
 13 provides a rich setting for engaging in engineering education research and the means
 14 to fund graduate students who are interested in advancing the field by transforming
 15 research into classroom practice. The department is adding tenure-track faculty with
 16 an aggressive research agenda that attracts graduate and undergraduate students to
 17 assist in funded engineering education research activities. Finally, departmental
 18 faculty teach a course on the professional practice of teaching to approximately 20-
 19 30 students each year from across the college. All of these current efforts are
 20 producing a source of students, many of whom are interested in teaching and
 21 engineering education. As a result, we have created a fertile recruiting ground for
 22 Ph.D. candidates from our own student numbers, while developing a program that
 23 attracts emerging engineering education researchers and practitioners nationally and
 24 internationally.

25
 26 **7. *Special efforts to enroll and retain underrepresented groups in the given discipline.***

27 The department plans to diversify our source of Ph.D. candidates and, while our research
 28 projects may well attract students from diverse backgrounds outside of Ohio State,
 29 promotional activities are planned to recruit beyond OSU and internationally. Recruiting is
 30 performed by participation at major engineering education events where faculty and staff
 31 serve as speakers, moderators, and program directors (e.g., the annual meeting of the
 32 American Society for Engineering Education (ASEE)). Direct promotion includes
 33 advertisements in major journals and directories, direct mailings, and booths at major
 34 conferences. Members of the faculty will draw upon their professional networks to recruit
 35 students directly and indirectly online and face-to-face. Faculty members in the related
 36 areas of study from other colleges (such as EHE T&L) will also contribute to student
 37 recruitment for engineering education as a subset within STEM education. This includes
 38 both the national and international level. Finally, the department will host prospective
 39 students at an annual reception day at our institution. This recruiting event will include
 40 personal contact with faculty and presentations on current research activities and available
 41 resources.

42
 43 Responding to college strategies, the Department of Engineering Education will place
 44 significant priority and resources to recruit women and underrepresented minority students
 45 to the proposed Ph.D. program. Centralized and coordinated outreach will intentionally

1 target messaging to welcome these underserved groups (Tsui, 2009). The College of
2 Engineering recruits on behalf of all engineering disciplines by attending graduate school
3 and exhibitor fairs at diversity conferences such as NSBE (National Society for Black
4 Engineers), SHPE (Society for Hispanic Professional Engineers), SWE (Society of Women
5 in Engineering), and AISES (American Indian Science and Engineering Society).
6

7 A lack of financial funding to support underrepresented minority students is known to be a
8 major barrier to the recruitment of this population (Quarterman, 2008). To aid in this
9 effort, OSU's College of Engineering currently has several different fellowship
10 opportunities available to underrepresented students across all engineering departments
11 (e.g., College of Engineering Graduate Fellowships, Discovery Scholars Fellowship), plus
12 multiple University-wide fellowships for which our students are also eligible. These are
13 great tools to help recruit talented individuals and are offered in addition to Graduate
14 Teaching Associateships, Graduate Research Associateships and Graduate Administrative
15 Associateships. In addition, the Department of Engineering Education will connect students
16 to national fellowship opportunities such as the Graduate Education for Minority
17 Fellowships.
18

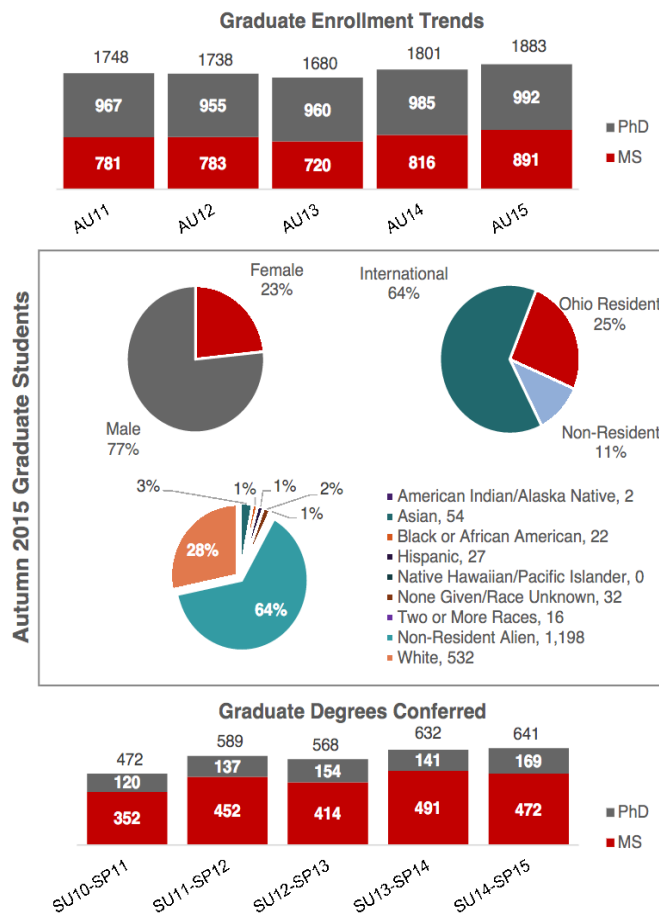
19 The Department of Engineering Education is establishing its own strategic approach to
20 enrolling and retaining Ph.D. students and, given the competitive climate for enrolling
21 underrepresented students, will make full-funding offers (stipend, tuition, and fees and 85%
22 health insurance subsidy) to students admitted early in the admission cycle. We will also
23 maintain consistent contact with our admitted students and bring them to campus to meet
24 with us on one or more occasions. As part of our retention efforts, our enrolled students
25 will participate in the College of Engineering's "graduate student survival skills workshop"
26 designed to help students transition to and be successful in graduate school. The workshop
27 is offered a few days prior to the start of their first semester and includes content on what to
28 expect in graduate school and how to be successful, how to communicate with advisors,
29 and how to find resources within the college and on campus. Studies have shown
30 mentoring programs to be particularly successful in supporting the retention and
31 persistence of underrepresented minorities and females (Olson, 1988; Chesler and Chesler,
32 2002) although all students benefit from this support. Thus, we will provide mentors for
33 our students during the first semester of study and encourage interaction throughout the
34 program.
35

36 One of the program's required core courses focuses on career exploration and professional
37 development (ENGREDU 7900). Students have the opportunity to participate in additional
38 professional development workshops and attend professionally-led seminars to expose
39 students to a broad range of potential careers. We will provide students with a mentoring
40 plan and encourage them to complete an Individual Development Plan (IDP). All our
41 students will have the opportunity to travel to conferences to present their research and will
42 be required to teach at least two semesters. The goal is to keep students connected to our
43 program throughout the admission/yield process by building communities to create a sense
44 of belonging and by providing support for their personal and professional career
45 development. Throughout their doctoral studies, each student will participate in an annual

1 review that will provide them with the opportunity to give and receive feedback that will
 2 aid their career planning. It is anticipated that this will benefit all of our graduate students,
 3 but it will especially assist in the retention and success of our students from
 4 underrepresented populations. At the time of graduation, we will provide students with exit
 5 surveys to gauge feedback about their experiences and gather employment data. Beyond
 6 graduation, we will continue to engage our graduates and invite them to participate in
 7 recruiting and mentoring of future students.

8 a. **Institution and departmental profiles of total enrollment and graduate student**
 9 **enrollment of underrepresented groups within the discipline**

10 Ohio State’s College of Engineering publishes annual enrollment data. Figure 1
 11 summarizes those data for engineering graduates for the period of 2011-2015 including
 12 demographic information. These data are for all engineering graduate students at OSU,
 13 not engineering education students. More closely aligned to the proposed program is
 14 the Ph.D. degree in STEM Education with a specialization in Engineering Education
 15 offered by the OSU College of Education and Human Ecology in collaboration with the
 16 Department of Engineering Education. The engineering education specialization was
 17 established in 2010 and has produced three graduates so far. Two of the three are from
 18 underrepresented populations.



19 **Figure 1. Engineering graduate enrollment trends (OSU College of Engineering, 2016)**
 20

1 **b. Comparison of underrepresented groups degree recipients from the**
 2 **department and university at all levels compared to national norms**

3 Based on annual data collected by the American Society for Engineering
 4 Education, 24% of master's students and 22% of doctoral candidates in U.S.
 5 colleges of engineering are women. OSU's College of Engineering is very close to
 6 national norms with women comprising 23% of the engineering graduate student
 7 numbers. Increasing the numbers of faculty role models is also important.
 8 Recently, *US News and World Report* stated that nationally only 15.2% of tenure-
 9 track engineering faculty are women, and only 2.5% and 3.9% of tenure-track
 10 engineering faculty are African-American or Hispanic, respectively (Morella,
 11 2016). In comparison, at Ohio State, women hold 20% of the tenure-track
 12 engineering faculty positions, and underrepresented minorities hold 5% of tenure-
 13 track positions (OSU College of Engineering, 2016). Across OSU, women make
 14 up 39 % of all faculty which includes tenure track, clinical and research but does
 15 not include instructors and lecturers (OSU The Women's Place, 2017). Faculty in
 16 the Department of Engineering Education are more diverse than elsewhere in the
 17 college and university, with 57% of the tenure-track faculty being women and 29%
 18 being underrepresented minorities. Among the unit's clinical faculty, 40% are
 19 women.

20
 21 **8. Availability and adequacy of the faculty and facilities available for the new degree**
 22 **program.**

23 **a. Competency, experience and number of faculty**

24
 25 The Department of Engineering Education (EED) is currently supported by 38
 26 faculty (tenure-track, clinical, and lecturers) and five staff. The faculty have the
 27 appropriate background, training, and experience to guide graduate students in
 28 doctoral research as evidenced in their CVs (Appendix 1). The research
 29 infrastructure at OSU is well positioned to support engineering education faculty in
 30 their grant activity. The department recently hired a new staff member for the
 31 position of graduate coordinator.

32 A summary of our current and projected faculty is shown in Table 1 along with
 33 their Graduate Faculty “P” status. The EED has achieved OSU’s minimum
 34 required departmental faculty of ten (we have eleven). We currently have seven
 35 faculty who hold “P” status in other departments or are eligible to do so once we
 36 have a degree program, and we have approval from the College of Engineering to
 37 hire two more tenure-track faculty in the next two years. Additionally, there are
 38 three STEM faculty with “P” status from the College of Education and Human
 39 Ecology (EHE) who have been offered courtesy appointments and who will be
 40 active in advising or co-advising our students. Our Associate Dean, a professor in
 41 Chemical and Biomolecular Engineering, also has a courtesy appointment with
 42 “P” status. Thus in total, we have eleven faculty with “P” status affiliated with the
 43 proposed doctoral program with two more to be added over the next two years.

1

Table 1. Current Faculty Status

Faculty Name	Title	P-Status	Comments
Monica Cox	Professor and Chair	Eligible	
Ann Christy	Professor and Asst. Dean	Yes	
Jeffrey Froyd	Professor	Eligible	
David Delaine	Assist. Professor	Eligible	
Rachel Kajfez	Assist. Professor	Eligible	
Emily Drinkenberg	Assist. Professor	Eligible	
David Tomasko	Professor and Assoc. Dean	Yes	Courtesy Appointment
Paul Post	Asst. Professor (EHE)	Yes	Courtesy Appointment
Karen Irving	Assoc. Professor (EHE)	Yes	Courtesy Appointment
Lin Ding	Assoc. Professor (EHE)	Yes	Courtesy Appointment
New Tenure Track	Assist. Professor	Eligible	Planned Hire 2018
New Tenure Track	Professor	Eligible	Planned Hire 2019
Rick Freuler	Professor of Practice	No	M-status
Peter Rogers	Professor of Practice	No	M-status
Deb Grzybowski	Assoc. Professor of Practice	Yes	
Krista Kecskemety	Asst. Professor of Practice	No	M-status eligible
Denver Tang	Asst. Professor of Practice	No	M-status eligible

2

3

b. Support and commitment of the proposing institution’s central administration

4

5

The institution's central administration indicated their support and commitment by the University Senate's vote on October 29, 2015, to approve a proposal recommending establishment of a new Department of Engineering Education at OSU. This recommendation was acted upon by the University Board of Trustees on November 6, 2015 when they voted to establish the new department. That proposal was solely about transitioning the unit from a college center to a department, (i.e., a change in administrative structure), but it did indicate general plans to develop a Ph.D. program to grow the field of engineering education and to support the tenure-track faculty who are now calling the new department their TIU home.

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1 **c. Adequacy of available resources committed for the initiation of the**
2 **program.**

3 The Fiscal Year 2016 budget for the Engineering Education Innovation Center
4 (EEIC), which transitioned into the Department of Engineering Education on
5 November 6, 2015, was \$5.8M. In 2015-2016, the department supported 32
6 graduate teaching assistants (GTAs), one graduate research associate (GRA),
7 125 undergraduate teaching assistants (UTAs), and two undergraduate
8 researchers. The ratio of GRAs to GTAs is expected to increase with the
9 inauguration of this new Ph.D. program, along with the number of fellowship
10 recipients. For 2016-2017 the Department of Engineering Education employed
11 44 Faculty and Staff, 22 GTAs, 2 GRAs, and 168 UTAs.

12 The College of Engineering has committed to the recruitment and hiring of
13 faculty who will ensure the success of our Ph.D. program. By the end of the
14 2017-18 hiring cycle, nine faculty in the EED will have or be eligible for “P”
15 status. We are forming partnerships that will include joint and courtesy
16 appointments also, thereby increasing the likelihood that co-advising will occur
17 with faculty across different OSU Colleges.

18
19 **d. Adequacy of available resources committed for the initiation of the**
20 **program.**

21 OSU has excellent computational facilities and support. Wireless internet
22 connectivity is available in every building on campus. The College of
23 Engineering has a wide selection of engineering-specific hardware and
24 networked software which is made available to students at more than a dozen
25 locations across the college. Included in Hitchcock Hall, our departmental
26 home, is a student computer laboratory which is part of the College of
27 Engineering's computer network and is available 24 hours per day to
28 undergraduate and graduate engineering students. The laboratory has color and
29 black-and-white printers, scanning capability, and large format printers,
30 plotters, and scanners. A student lab-room monitor and/or a service desk area
31 are available for troubleshooting and consultation during posted hours.

32 University Libraries at Ohio State have a combined collection of nearly 5.8
33 million volumes and annually receive approximately 35,000 serial titles.
34 University Libraries consists of the Thompson (Main) Library and fourteen
35 other specialized libraries. There are collections in agriculture, art, life and
36 physical sciences, economics, education, engineering, human ecology,
37 journalism, music, psychology, pharmacy, social work, and more. Each library
38 provides access to the Libraries' online catalog/circulation system, as well as to
39 indexes, abstracts, and bibliographies pertinent to its subject area(s). Librarians
40 familiar with the subject areas and expert in associated research techniques are
41 available for consultation research. University Libraries is also a member of
42 OhioLINK, a statewide library and information network linking the major
43 academic and community college libraries in Ohio with the State Library.

1 Serving the education research community, the William Oxley Thompson (Main)
2 Library houses the university's collections in humanities and social sciences including
3 education. Built in 1913 and most recently renovated in 2009, it is an 11-story
4 building with 306,000 square feet of space. Serving the engineering research
5 community, the 18th Avenue Library houses the university's collections in
6 Engineering, Architecture, Astronomy, Chemistry, Physics, Mathematics, Music, and
7 Dance. Built in 1993, it is a five-story building with just under 70,000 square feet and
8 24-hour access (with a valid OSU ID). The University Library developed and hosts an
9 online research guide specifically related to engineering education
10 <http://guides.osu.edu/engineering_education>. This resource for faculty, staff, and
11 students includes links to databases, journals, eBooks, and dissertations in the field of
12 engineering education.

13 Classrooms and instructional spaces serve as laboratories for some research
14 specializations within engineering education. Departmental faculty currently teach
15 more than 8,000 credit hours per semester including providing instruction to all first-
16 year engineering students and a wide range of other undergraduate students in courses
17 not offered by other units in the College of Engineering. Engineering Education
18 faculty also teach graduate courses in areas such as research methodology, engineering
19 education foundations, and effective college teaching. All of the department's
20 undergraduate courses are taught in dedicated and specially-constructed instructional
21 spaces. Most instructional spaces have a computer workstation for each student. All
22 instructional spaces have video display systems and audio enhancement. Most
23 assigned instructional rooms are in Hitchcock Hall and have a furniture layout
24 conducive to student team collaboration, with teams of four students being typical.
25 Student tables are, in general, of working height (39 inches) with some furniture
26 having accommodation for students with disabilities. There are two larger
27 multipurpose rooms having in-room shelving which allows for readily available
28 curriculum-related items. Two other classrooms in Caldwell Lab and one classroom in
29 Drees Lab are dedicated to offering the department's engineering technical
30 communication courses.

31 Technical engineering laboratories include space in Hitchcock Hall and Smith
32 Laboratory that support our experiential programs and courses including the First-
33 Year Engineering Program, Engineering Technical Communications, Integrated
34 Business and Engineering, and Multidisciplinary Capstone. This space includes
35 student work space, storage space, creative instructional space, and prototyping
36 equipment. Prototyping areas feature hand tools and clear areas for construction and
37 assembly, floor and bench mounted machines (e.g., drill presses, milling machines,
38 grinders and sanders), and rapid prototyping 3-D printers. Recently acquired space
39 and reallocated space has created a designated research space that is used exclusively
40 to house research faculty, staff, and students.

41 The majority of faculty offices are in Hitchcock Hall. The Department of Engineering
42 Education has a dedicated conference room and several other rooms available in
43 Hitchcock Hall and Smith Lab to schedule general meetings, research interviews, and
44 professional presentations. It also has dedicated space to support researchers
45 including graduate teaching and research associates (GTAs and GRAs), postdoctoral

1 professionals, visiting scholars, and other research support staff. More space is needed
2 given the faculty hiring plan and the increased numbers of undergraduate and graduate
3 students served by the department.

4
5 **9. *Need for additional facilities and staff and the plans to meet.***

6 Two additional tenure-track faculty are needed, and OSU's College of Engineering has
7 agreed to authorize these faculty hires over the next two years. In August 2017, the
8 department hired a graduate program coordinator, under an A&P staff position. Facilities are
9 adequate, but further expansion of the program will require additional space and/or creative
10 changes in usage of existing departmental space.

11
12 **10. *Projected additional costs associated with the program and evidence of institutional***
13 ***commitment and capacity to meet these costs.***

14 Projected additional costs specifically associated with the proposed graduate program
15 include faculty salaries and start-up packages, recruiting faculty and Ph.D. students,
16 graduate student funding (stipends, tuition, and fees including student health insurance),
17 and professional development/conference attendance funds for graduate students on a
18 competitive basis. These additional costs are supported by a combination of university
19 and college fellowships, research grants, teaching assistantships, new faculty start-up
20 allocations, development funds, and other departmental funding. The department's large
21 teaching commitment, serving more than 3500 undergraduates annually, means that
22 there is an assured pool of more than twenty graduate teaching assistantships (GTAs)
23 available each year, although not all of these GTA positions will always be filled by
24 engineering education doctoral students. This provides a solid basis for supporting the
25 proposed doctoral program in engineering education at the Ohio State University.
26

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40

Appendices

1. Faculty Curriculum Vitae
2. Curriculum
 - a. Program goals, learning outcomes, and levels of proficiency
 - b. Curricular map
 - c. Example semester-by-semester plans
 - d. Student advising sheet
 - e. Examples of Engineering Education Doctoral Dissertation Titles from Purdue University and Virginia Tech (2006-2015)
3. Course Syllabi
4. Assessment Plan (TracDat)
5. Needs Survey
6. Letter of Support
7. Fiscal Impact Statement (template, data to be added later)

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Professor and Department Chair

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Education

Ph.D. Leadership and Policy Studies, 2005. Vanderbilt University, Nashville, TN
M.S. Industrial Engineering, 2000. University of Alabama, Tuscaloosa, AL
B.S. Mathematics, 1998. Spelman College, Atlanta, GA

Employment History

Professor & Inaugural Department Chair, Department of Engineering Education, The Ohio State University, Columbus, OH (2015-present)
Associate Professor of Engineering Education, Purdue University, West Lafayette, IN (2005-2015)
Chief Executive Officer, STEMinent LLC (2013-present)
Inaugural Director, Engineering Leadership Minor, Purdue University, West Lafayette, IN (2012-present)
Interim Statewide Director, Louis Stokes Alliance for Minority Participation, Purdue University, West Lafayette, IN (2011-2014).

Publications (Summary)

- Peer-reviewed journal articles: 31
- Proceedings and abstracts: 68
- Chapters in edited books: 6
- Bulletins, tech reports, and fact sheets: 3

Courses Taught in Engineering Education (Taught at Purdue University, arrived at OSU in January 2016)

1. Seminar in Engineering Education (ENE 695A)
2. Introduction to Engineering and Purdue (ENGR 103)
3. Instruction, Mentorship, and Leadership (ENGR 404)
4. Problem Solving & Design for Diverse Learners (ENE 695C)
5. Engineering Problem Solving and Computer Tools (ENGR 126)
6. Leadership, Policy, & Change in STEM Education (ENE 695I)
7. Effective Teaching of Engineering: Linking Theory and Practice (ENE 595G)
8. Transforming Ideas to Innovation I (ENGR 19500)
9. Harnessing Engineering Expertise (ENE 695)
10. Planning for Engineering Leadership Development (ENE 195)
11. E-Portfolio: Experience Engineering Leadership (ENE 195)

Graduate Student Advising

- PhD students advised: 10 graduated (Engineering Education Ph.D.s, Purdue University)

Selected Recent Publications (Engineering Education Journal Articles)

1. Bairaktorova, D., Cox, M.F., & Evangelou, D. (2012). Leadership Training in Science, Technology, Engineering, and Mathematics (STEM) Education in Bulgaria. *European Journal of Engineering Education*, 36, 6, 585-594.
2. Bernstein, W.Z., Ramanujam, D., Zhao, F., Ramani, K., & Cox, M.F. (2012). Teaching Design for Environment through Critique within a Project Based Product Design Course. *International Journal of Engineering Education*, 28, 4, 1-12.
3. Cox, M.F., Ahn, B., Cekic, O., & Zhu, J. (2012). Engineering Professionals' Expectations of Undergraduate Engineering Students. *Leadership and Management*, 12, 2, 60-70.
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10. London, J., Cox, M.F., Ahn, B., Branch S., Torres-Ayala, A., Zephirin, T., & Zhu, J. (2014). Motivations for Pursuing an Engineering Ph.D. and Perceptions of its Added Value. *International Journal of Doctoral Studies*, 9, 205-227.
11. Ahn, B., Cox, M.F., Zephirin, T., Haller, Y., Groll, E., Taylor, K., Davenport Sypher, B., & Adams, S. (2014). Development of Professional Workshop to Cultivate Professional Skills among Engineering Managers: Lessons Learned from a Professional Development Workshop. *International Journal of Engineering Education*, 30, 1621-1635.
12. Berdanier, C. G., & Cox, M. F. (2015). Research and Assessment of Learning Environments through Photoelicitation: Graduate Student Perceptions of Electronics Manufacturing in India. *Advances in Engineering Education*, 4(4), n4.
13. Bairaktarova, D., Cox, M.F., & Srivastava, M. (2015). A Project-Based Approach to Professional Skills Training in an Undergraduate Engineering Curriculum. *International Journal of Engineering Education*, 31, 1, 425-433.
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15. Berdanier, C.G.P, Tally, A., Branch, S.E., Ahn, B., & Cox, M.F. (2016). A strategic blueprint for the alignment of doctoral competencies with disciplinary expectations, *International Journal of Engineering Education*, 32, 4, 759-1773.

Honors and Awards

- Purdue University College of Engineering Faculty Award of Excellent for Leadership (2014)

- Purdue University Entrepreneurial Leadership Academy Fellow (2013)
- Purdue Black Graduate Student Association (BGSA) Engagement Award Recipient (2013)
- Presidential Early Career Award for Scientists and Engineers (PECASE) Recipient (2008)
- Diverse Issues in Higher Education Emerging Scholar (2008)
- National Science Foundation Early Faculty CAREER Award Recipient (2007)
- National Academies of Engineering/Center for the Advancement of Scholarship in Engineering Education New Faculty Fellow, Frontiers in Education Conference (2006)
- Purdue University Teaching for Tomorrow Award Recipient (2006-2007)
- Vanderbilt University Department of Leadership, Policy, and Organizations Graduate Student Representative (2002-03)*
- VaNTH Engineering Research Center Student Leadership Council Chairperson (2001-2005)
- Vanderbilt University Posse Foundation/Dean's Graduate Fellow (2000-05) University of Alabama Graduate Council Fellow (1999-2000)
- University of Alabama National Alumni Association Fellow (1998-99)
- NASA/Graduate Degrees for Minorities in Engineering and Science (GEM) Scholar (1998-2000)
- Spelman College NASA/Women in Science and Engineering (WISE) Scholar (1994-98)

Inter-Institutional Collaborations

- Cornell University (Co-PI)
- Howard University (Advisory Board Member)
- Indiana University (Co-PI)
- Indiana University-Purdue University Indianapolis (Co-PI)
- Ivy Tech Community College (co-PI)
- Norfolk State University (Co-PI)
- Purdue University (Co-Author, PI, Co-PI)
- Rose-Hulman Institute of Technology (Co-Author)
- Shanghai Jiao Tong University (Co-Author)
- Universidad de Las Americas Puebla (Mexico) (Visiting Professor)
- University of Pittsburgh (Co-Author)
- Vanderbilt University (PI)
- Virginia Polytechnic Institute and State University (Engineering Education Advisory Board Member)

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Education

Ph.D. Environmental Systems Engineering, 1991. Clemson University, Clemson, SC.

M.S. Biomedical Engineering, 1985. The Ohio State University, Columbus, OH.

B.S. Agricultural Engineering, 1983. The Ohio State University, Columbus, OH.

Employment History

Professor, Department of Engineering Education, The Ohio State University, Columbus, OH (2016-present).

Professor, Department of Food, Agricultural, and Biological Engineering (FABENG), The Ohio State University, Columbus, OH (1996-present).

Senior Associate Engineer / Board of Directors member, Bennett and Williams Environmental Consultants Inc., Westerville, OH (1999-present part-time).

Interim Director, Engineering Education Innovation Center, College of Engineering, The Ohio State University, Columbus, OH (2014-2015)

Provost Faculty Fellow, Office of Academic Affairs, The Ohio State University, Columbus, OH (2009-2012)

Interim Associate Dean for Undergraduate Education and Student Services, College of Engineering, The Ohio State University, Columbus, OH (2008-2009).

Senior Engineer, Killam Associates Consulting Engineers, Millburn, NJ (1992-1995 full time, 1996-1999 part-time).

Professional Registration and Certifications

- Registered Professional Engineer, State of Ohio (1996 -present)
- ABET Engineering Accreditation Commission (ABET-EAC) program evaluator (2009 – present)
- American Council for Construction Education (ACCE) program evaluator (2008-2013)

Courses Taught at the Ohio State University (OSU), Columbus, Ohio

1. Fundamentals of Engineering II for Honors (ENGR 1282.01H)
2. Introduction to Food, Agricultural, and Biological Engineering (FABENG 225)
3. Modeling and Design of Biological Systems (FABENG 625)
4. Environmental Controls for Agricultural Structures (FABENG 645, 5820)
5. Design of Waste Management Systems (FABENG 650)
6. Thermodynamics (FABENG 2120, 3120)
7. Biomass Conversion to Bioenergy (FABENG 5540)
8. Science and Engineering for Life – On Earth and in Space (FABENG 694 Group studies for high school science teachers)
9. Professional Development (FABENG 695, 3140)
10. Sustainable Housing for Informal Settlements in South Africa (an OSU Study Abroad program, FABENG 697.01)
11. Capstone Design (FABENG 723, 724, 725)
12. Departmental / Graduate Seminar (FABENG 850)
13. College Teaching in Engineering (FABENG 7220)

Graduate student advising:

- PhD students advised: 5 graduated (4 FABENG, 1 Env. Sci.)
- Masters students advised: 11 graduated (9 FABENG, 1 Env. Sci., 1 Historic Preservation), 2 current (FABENG)

Publications (Summary):

- Peer-reviewed journal articles: 33
- Proceedings and abstracts: 87 (34 peer-reviewed)
- Chapters in edited books: 2
- Bulletins, tech reports, and fact sheets: 9
- Editor-reviewed journal articles: 8

Selected recent publications (Engineering education related):

1. Lima, M., and Christy, A.D. 2017. Service learning in biological and agricultural engineering: Journeys in community engagement. *ASEE Annual Conference*, American Society for Engineering Education. Paper No. AC 2017-20133. 7 p. (Peer reviewed)
2. Christy, A.D., and Fasina, O. 2017. Student ePortfolios for undergraduate professional development: A comparison of two programs. *ASEE Annual Conference*, American Society for Engineering Education. Paper No. AC 2017-20035. 7 p.
3. Christy, A. D. 2014. Students' selection of topics for a professional development course. *2014 ASEE Annual Conference*, American Society for Engineering Education. ASEE Paper # AC 2014-10643. 5 p.
4. Christy, Ann D. 2013. "Student portfolios for assessing ABET a-k outcomes." *Proceedings of the 2013 ASEE North Central Section Conference*. 12 p.
5. Chen, Q., A.D. Christy, M.E. Owens, D. Bortz, W. Greene, and B. King. 2012. Two-plus-two construction management programs and articulation agreements. *International Journal of Construction Education and Research*. 8(1): 4-25.
6. Christy, A.D. 2011. Engaging Students to Prepare them for the Engineering Profession and Reflect upon their Undergraduate Career. ASABE Paper No.11-11605. St. Joseph, Mich: ASABE. 8p.
7. Owens, Margaret, Qian Chen, Ann Christy, Wesley Greene, and Ben King. 2010. Articulation between 2-Year and 4-Year Construction Management Programs. *ASC International Proceedings of the 46th Annual Conference*, Associated Schools of Construction. Boston, MA. April 7-10, 2010. 8 p.
8. Ward, Andy, Ann Christy, Robert Gustafson, Jessica D'Ambrosio, and Kurt Paterson. 2009. Globalizing Engineering Education: Lessons Learned from Africa and USA Partnerships. *2009 ASEE Annual Conference*, American Society for Engineering Education. June 15-17, 2009. Paper # AC 2009-2207. 16 p.
9. Abadie, A., A.D. Christy, J. Jones, J. Wang, and M. Lima. 2009. Longitudinal survey of female faculty in biological and agricultural engineering. *Transactions of the ASABE* 52(4): 1397-1405.
10. Christy, Ann, Andy Ward, Jeff Hughes, Simon Lorentz, and Bethany Corcoran. 2008. An Experiential and Service Learning Capstone design Initiative in South Africa. *2008 ASEE Global Colloquium*, American Society for Engineering Education. CapeTown, South Africa, October 2008. Paper # GC 2008-124. 11 p.
11. Christy, A.D., and M. Lima. 2007. Teaching creativity and multidisciplinary approaches to engineering problem-solving. *International Journal of Engineering Education* 23(4): 636-644.
12. Ward, Andy D., Kerry Hughes Zwierschke, Carol Moody, and Ann D. Christy. 2007. Developing Sustainable Solutions for Impoverished Communities in South Africa: A Student Centered and Service Learning Capstone Design Experience. *American Society of Agricultural and Biological Engineers Annual Meeting*. ASABE Paper 07-8018. 8 p.
13. Christy, Ann D., Margaret E. Owens, and Mary J. Faure. 2007. Student Portfolios, Business Communications, Engineering Poetry Contests, and Grading Multiple Drafts of Technical Writing Documents. *American Society of Agricultural and Biological Engineers Annual Meeting*. ASABE Paper 07-8001. 7 p.
14. Graf, Julie A., and Ann D. Christy. 2006. Assessing perceptions of education: A case for increased interdisciplinarity. *American Society of Agricultural and Biological Engineers Annual Meeting*. ASABE Paper 06-8001. 16 p.
15. Christy, A.D., Karen M. Mancl, and Michael Rowan. 2005. Co-teaching an engineering class with an agricultural technology management class on the topic of waste and wastewater treatment. *American Society of Agricultural Engineers Annual Meeting*. ASAE Paper 05-8009. 5 p.
16. Christy, A.D., and J. Graf. 2005. Departmental to inter-collegiate engineering poetry contests. *2005 ASEE Annual Conference*, American Society for Engineering Education. June 2005. 9 p. (Peer reviewed).
17. Christy, A.D. 2004. Renaissance learning and poetry contests in biological and agricultural engineering. *2004 ASEE Annual Conference*, American Society for Engineering Education. June 2004. 6 p.
18. Hughes, K.L., and A.D. Christy. 2002. Biological engineering education and the biology knowledge

- explosion: Lessons from biology educators. *American Society of Agricultural Engineers Annual Meeting*. ASAE Paper 02-7030. 8 p.
19. Owens, Margaret E., James C. Papritan, and Ann D. Christy. 2002. The Student Portfolio as an Assessment Tool in Agricultural and Construction Health and Safety Courses. *Meeting of the National Institute for Farm Safety, Inc.*, 14 p.
 20. Hughes, K.L., D.A. Farver, A.D. Christy, and M. Lima. 2001. A review of currently available texts for biological engineering courses. *2001 ASEE Annual Conference Proceedings*, American Society for Engineering Education. 6 p.
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 25. Lima, M., A.D. Christy, M. Owens, and J.C. Papritan. 1999. The use of student portfolios to enhance learning and encourage industrial ties in undergraduate education. *NACTA Journal* 43(3): 51-54.
 26. Christy, A.D., and M. Lima. 1999. Biological engineering student design projects with real clients. *1999 ASEE Annual Conference Proceedings*, American Society for Engineering Education. 7p.
 27. Cauble, S., A.D. Christy, and M. Lima. 1999. A survey of biological and agricultural engineering female faculty in North America. *1999 ASEE Annual Conference Proceedings*, American Society for Engineering Education. 11p.
 28. Christy, A.D. and M. Lima. 1998. The use of student portfolios in engineering instruction. *Journal of Engineering Education* 87(2): 143-148.

Honors and Awards

- Massey-Ferguson Educational Gold Medal Award, American Society of Agr. and Biological Engineers (2017)
- The Ohio State University President and Provost's Award for Distinguished Faculty Service (2017)
- Department of Engineering Education Outstanding Service to the Department Award (2017)
- U.S. Department of Agriculture National Award for Excellence in College and University Teaching (2016)
- Recipient of the Ohio State University Board of Trustees "Resolution of appreciation for the leadership vital in developing strategies and a structure to implement the transition of The Ohio State University from the quarter to semester system," Resolution No. 2012-100 (2012)
- Star Student Supporter Award, College of Food, Agr., and Environmental Sciences' Student Council (2012)
- The Ohio State University Alumni Award for Distinguished Teaching (2007)
- OARDC William E. Krauss Award for Excellence in Graduate Research, Faculty Advisor Award (2007)
- U.S. Department of Agriculture North Central Regional Award for Excellence in College and University Teaching (2005)
- Boyer Award for Excellence in Teaching Innovation, OSU College of Engineering (2005)
- Charles E. MacQuigg Student Award for Outstanding Teaching, OSU College of Engineering (2004)
- Teaching Award of Merit, Ohio State Chapter of Gamma Sigma Delta (2003)

Inter-institutional collaborations

- Columbus State Community College (co-author)
- Louisiana State University (co-author, co-PI)
- North Carolina State University (co-PI)
- University of Kentucky (co-author)
- University of Illinois (co-PI)
- University of Nebraska -Lincoln (co-PI)

Industry collaborations

- Bennett and Williams Environmental Consultants Inc. (co-author, Board of Directors member)

Jeffrey E. Froyd, Ph.D.

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Education

Ph.D. Electrical Engineering, 1979. University of Minnesota – Twin Cities, Minneapolis, MN.
M.S. Electrical Engineering, 1975. University of Minnesota – Twin Cities, Minneapolis, MN.
B.S. Mathematics, 1974. Rose-Hulman Institute of Technology, Terre Haute, IN.

Employment History

Professor, Department of Engineering Education, The Ohio State University, Columbus, OH (2017- present)
Research Professor, Engineering Academic and Student Affairs, College of Engineering, Texas A&M University, College Station, TX (2011-2017).
Director of Faculty Climate and Development, Office of the Dean of Faculties and Associate Provost, Texas A&M University, College Station, TX (2007-2011).
Research Professor, Center for Teaching Excellence, Texas A&M University, College Station, TX (2004-2007).
Project Director, Foundation Coalition, Texas A&M University, College Station, TX (2001-2004)
Visiting Professor, Department of Electrical and Computer Engineering, College of Engineering, Texas A&M University, College Station, TX (1999-2001)
Professor, Department of Electrical and Computer Engineering, Rose-Hulman Institute of Technology, Terre Haute, IN (1990-1999).
Senior Systems Engineer, Applied Computing Devices, Terre Haute, IN (1992-1993, sabbatical).
Associate Professor, Department of Electrical and Computer Engineering, Rose-Hulman Institute of Technology, Terre Haute, IN (1984-1990).
Assistant Professor, Department of Electrical and Computer Engineering, Rose-Hulman Institute of Technology, Terre Haute, IN (1981-1984).

Professional Registration and Certifications

- ABET Engineering Accreditation Commission (ABET-EAC) program evaluator (1999 – present)

Courses Taught at Rose-Hulman Institute of Technology, Terre Haute, IN

1. Integrated, First-year Curriculum in Science, Engineering, and Mathematics (SEM 101, SEM 102, SEM 103, 12 credit hours each quarter)
2. Design of Feedback Systems (EE 471)
3. Control Systems I (EE 572)
4. Control Systems II (EE 573)
5. Electrical Circuits I (EE 211)
6. Electrical Circuits II (EE 212)
7. VLSI Design I (EE 581)
8. VLSI Design II (EE 582)
9. VLSI Design III (EE 583)
10. Engineering Design I (EE 460)
11. Engineering Design II (EE461)

Publications (Summary):

- Peer-reviewed journal articles: 22
- Proceedings and abstracts: 67 (60 peer-reviewed)
- Book: 1
- Chapters in edited books: 1

Selected recent publications (Engineering education related):

1. Stanford, C., Cole, R. Cole, Froyd, J. E., Henderson, C., Friedrichsen, D., & Khatri, R. (2017). Analysis of propagation plans in NSF-funded education development projects, *Journal of Science Education and Technology*, doi: 10.1007/s10956-017-9689-x
2. Taylor, L. L., Beck, M. I., Lahey, J. I., & Froyd, J. E. (2017). Reducing Inequality in Higher Education: The Link between Faculty Empowerment and Climate and Retention, *Innovative Higher Education*, doi: 10.1007/s10755-017-9391-1
3. Khatri, R., Henderson, C., Cole, R. S., Froyd, J. E., Friedrichsen, D., & Stanford, C. (2017). Characteristics of well-propagated teaching innovations in undergraduate STEM. *International Journal of STEM Education*, 4(2), 1-10. doi:10.1186/s40594-017-0056-5
4. Stanford, C., Cole, R. S., Froyd, J. E., Friedrichsen, D., Khatri, R., & Henderson, C. (2016). Supporting sustained adoption of education innovations: The Designing for Sustained Adoption Assessment Instrument. *International Journal of STEM Education*, 3(1), 1-13. doi:10.1186/s40594-016-0034-3
5. Khatri, R., Henderson, C., Cole, R., Froyd, J. E., Friedrichsen, D., & Stanford, C. (2016). Designing for sustained adoption: A model of developing educational innovations for successful propagation. *Physical Review Physics Education Research*, 12(1), 010112-1-22. doi:10.1103/PhysRevPhysEducRes.12.010112
6. Borrego, M., Foster, M. J., & Froyd, J. E. (2015). What is the state of the art of systematic review in engineering education? *Journal of Engineering Education*, 104(2), 212-242. 10.1002/jee.20069
7. Borrego, M., Foster, M. J., & Froyd, J. E. (2014). Systematic literature reviews in engineering education and other developing interdisciplinary fields. *Journal of Engineering Education*, 103(1), 45-76. doi: 10.1002/jee.20038
8. Atilhan, M., ElJack, F., Alfadala, H., Froyd, J. E., El-Halwagi, M., & Mahalec, V. (2014). Inquiry guided learning in a chemical engineering core curriculum: General instructional approach and specific application to the fluid mechanics case. *International Journal of Engineering Education*, 30(6), 1450-1460. Retrieved from <http://www.ijee.ie/contents/c300614A.html>
9. Borrego, Maura, Cutler, Stephanie, Prince, Michael J., Henderson, Charles, & Froyd, Jeffrey E. (2013). Fidelity of implementation of research-based instructional strategies (RBIS) in engineering science courses. *Journal of Engineering Education*, 102(3), 394-425. doi: 10.1002/jee.20020
10. Borrego, Maura, Froyd, Jeffrey E., Henderson, Charles, Cutler, Stephanie, & Prince, Michael J. (2013). Influence of engineering instructors' teaching and learning beliefs on pedagogies in engineering science courses. *International Journal of Engineering Education*, 29(6), 1-16.
11. Prince, Michael J., Borrego, Maura, Cutler, Stephanie, Henderson, Charles, & Froyd, Jeffrey E. (2013). Use of research-based instructional strategies in core chemical engineering courses. *Chemical Engineering Education*, 47(1), 27-37.
12. Froyd, Jeffrey E., Borrego, Maura, Cutler, Stephanie, Henderson, Charles, & Prince, Michael J. (2013). Estimates of use of research-based instructional strategies in core electrical or computer engineering courses. *IEEE Transactions on Education*, 56(3). doi: 10.1109/TE.2013.2244602
13. Froyd, Jeffrey E., Wankat, Phillip C., & Smith, Karl A. (2012). Five major shifts in 100 years of engineering education. *Proceedings of the IEEE*, 100(13), 1344-1360. doi: 10.1109/JPROC.2012.2190167
14. Froyd, J. E., Hurtado, L. D., Lagoudas, M. Z., Nite, S., Hobson, M., Hodge, J. & Monroe, J. (2012) *Increasing Access to Engineering*. Paper presented at the Frontiers in Education Conference. doi: 10.1109/FIE.2012.6462265
15. Cutler, Stephanie, Borrego, Maura, Henderson, Charles, Prince, Michael J., & Froyd, Jeffrey E. (2012). *A comparison of electrical, computer, and chemical engineering faculties' progressions through the innovation-decision process*. Paper presented at the Frontiers in Education Conference, Seattle, WA. doi: 10.1109/FIE.2012.6462405
16. Shryock, Kristi J., Srinivasa, Arun R., & Froyd, Jeffrey E. (2011). *Developing instruments to assess first-year calculus and physics mechanics skills needed for a sophomore statics and dynamics course*. Paper presented at the Frontiers in Education Conference, Rapid City, SD, USA. doi: 10.1109/FIE.2011.6142722
17. Shryock, K. J., Srinivasa, A. R., & Froyd, J. E. (2011). *Alignment of preparation via first-year physics mechanics and calculus courses with expectations for a sophomore statics and dynamics course*. Paper presented at the ASEE Annual Conference & Exposition. Retrieved November 14, 2011 from <https://peer.asee.org/17434>
18. Shryock, K. J., Srinivasa, A. R., & Froyd, J. E. (2011). *Assessing first-year calculus knowledge and skills needed for a sophomore statics and dynamics course*. Paper presented at the ASEE Annual Conference & Exposition. Retrieved November 14, 2011 from <https://peer.asee.org/17519>
19. Shryock, K. J., Srinivasa, A. R., & Froyd, J. E. (2011). *Assessing first-year physics mechanics knowledge and*

- skills needed for a sophomore statics and dynamics course*. Paper presented at the ASEE Annual Conference & Exposition. Retrieved November 14, 2011 from <https://peer.asee.org/17520>
20. Shryock, K. J., Srinivasa, A. R., & Froyd, J. E. (2011). *Preparing engineering students to take a calculus course: An engineering-oriented approach*. Paper presented at the ASEE Annual Conference & Exposition. Retrieved November 14, 2011 from <https://peer.asee.org/18704>
 21. Ulseth, R. R., Froyd, J. E., Litzinger, T. A., Ewert, D., & Johnson, B. M. (2011). *A new model of project based learning*. Paper presented at the ASEE Annual Conference & Exposition. Retrieved November 14, 2011 from <https://peer.asee.org/17360>
 22. Litzinger, T. A., Zappe, S. E., Borrego, M. J., Froyd, J. E., Newstetter, W., Tonso, K. L., et al. (2011). *Writing effective evaluation and dissemination/diffusion plans*. Paper presented at the ASEE Annual Conference & Exposition. Retrieved November 14, 2011 from <https://peer.asee.org/18994>
 23. Hodge, J. Q., Lagoudas, M. Z., Harris, A. M., Froyd, J. E., Hobson, M., & Pope, J. A. (2011). *Influencing the academic success of undergraduate first-year engineering students through a living learning community*. Paper presented at the ASEE Annual Conference & Exposition. Retrieved November 14, 2011 from <https://peer.asee.org/18160>
 24. Froyd, J. E., Schwartz, C. J., & Rajagopal, K. R. (2011). *Comprehensive course redesign: Introduction to the mechanics of materials*. Paper presented at the ASEE Annual Conference & Exposition. Retrieved November 14, 2011, from <https://peer.asee.org/17638>
 25. Borrego, Maura, Froyd, Jeffrey E., & Hall, T. Simin. (2010). Diffusion of engineering education innovations: A survey of awareness and adoption rates in U.S. engineering departments. *Journal of Engineering Education*, 99(3), 185-207. doi: 10.1002/j.2168-9830.2010.tb01056.x
 26. Fowler, D. A., Froyd, J. E., & Layne, J. (2010). *Curriculum Redesign: Concurrently Addressing Content Mastery and Development of Cognitive Abilities*. Paper presented at the Frontiers in Education Conference. doi: 10.1109/FIE.2010.5673605
 27. Merton, P., Froyd, J. E., Clark, M. C., & Richardson, J. (2009). A case study of relationships between organizational culture and curricular change in engineering education. *Innovative Higher Education*, 34(4), 219–233. doi: 10.1007/s10755-009-9114-3
 28. Watson, K., and Froyd, J. (2007). Diversifying the U.S. Engineering Workforce: A New Model, *Journal of Engineering Education*, 96(1), 19–32. doi: 10.1002/j.2168-9830.2007.tb00912.x
 29. Froyd, J., and Ohland, M. (2005). Integrated Engineering Curricula, *Journal of Engineering Education*, 94(1), 147–164
 30. Clark, M.C., Froyd, J., Merton, P., Richardson, J. (2004). The Evolution of Curricular Change Models Within the Foundation Coalition. *Journal of Engineering Education*, 93(1), 37-47
 31. Fournier-Bonilla, S. D., Watson, K., Malavé, C., and Froyd, J. (2001). Managing Curricula Change in Engineering at Texas A&M University. *International Journal of Engineering Education*, 17(3), 222-235
 32. Al-Holou, N., Bilgutay, N. M., Corleto, C., Demel, J. T., Felder, R., Frair, K., Froyd, J., Hoit, M., Morgan, J., Wells, D.L. (1999). First-Year Integrated Curricula: Design Alternatives and Examples. *Journal of Engineering Education*, 88(4), 435-448. doi: 10.1002/j.2168-9830.1999.tb00471.x
 33. Cordes, D., Evans, D.L., Frair, K., and Froyd, J. (1999). The NSF Foundation Coalition: The First Five Years. *Journal of Engineering Education*, 88(1), 73-77. doi: 10.1002/j.2168-9830.1999.tb00414.x

Honors and Awards

- 2015 Distinguished Member Award, IEEE Education Society
- 2012 ASEE Fellow
- 2012 IEEE Fellow
- 2011 Benjamin Dasher Award, Best Paper, Frontiers in Education Conference
- 1998 Ten Best Papers Award, Frontiers in Education Conference
- 1997 Hesburgh Award Certificate of Excellent for the Integrated First-year Curriculum in Science, Engineering and Mathematics, Rose-Hulman Institute of Technology
- 1985 Dean's Outstanding Teaching Award, Rose-Hulman Institute of Technology

Inter-institutional collaborations

- Western Michigan University, University of Iowa (co-author, co-PI)
- University of Texas at Austin, Clemson University (co-author, co-PI)
- Virginia Polytechnic Institute and State University, Bucknell University (co-author, co-PI)
- University of Alabama, Arizona State University, Texas A&M University Kingsville, University of Wisconsin, Rose-Hulman Institute of Technology (co-author, co-PI)

DAVID A. DELAINE, Ph.D.

Assistant Professor

Department of Engineering Education

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Education

Ph.D. Electrical Engineering, 2012, Drexel University, Philadelphia, PA

B.S. Electrical Engineering, 2005, Northeastern University, Boston, MA

Employment History

- *Vice President for Diversity & Inclusion* October 2013 - October 2017
International Federation of Engineering Education Societies (IFEES)
- *Postdoctoral Fellow* Escola Politécnica, Universidade de São Paulo July 2013 - March 2016
Poli-Edu - Research Group in Engineering Education

Graduate Student Advising

- Thesis Committee Member for 2 Ph.D. and 1 Masters Dissertation defense at the Universidade de São Paulo – Escola Politécnica

Courses Taught

1. Introduction to Engineering
2. Math Practicum – Calculus for Engineers
3. Linear Algebra

Publications (Summary):

- Peer-reviewed journal articles: 4
- Proceedings and abstracts: 22 (17 peer-reviewed)
- Bulletins, tech reports, and fact sheets: 2

Selected recent publications (Engineering education related):

1. **D. Delaine**, D. Williams, R. Tull, R. Sigamoney. “Global Diversity and Inclusion in Engineering Education: Developing platforms towards increased international collaboration.” *International Journal of Engineering Pedagogy*.
2. **D. Delaine**, D. Williams, R. Tull, R. Sigamoney. “Global Diversity in Engineering Education: An Exploratory Analysis.” Proceedings of the 2015 World Engineering Education Forum, Florence, Italy, 2015
3. **D. Delaine**, L. Yanaze, et al. “Perfil dos ingressantes em engenharia na escola politécnica da USP, utilizando a FUVEST 2015 como processo de ingress.” Proceedings of the XLII Congresso Brasileiro de Educação 2015, September, 2015.
4. **D. Delaine**, J.R. Cardoso, J. Walther. “Qualitative Analysis of Boundary Spanning Implications within Interviews of Engagement Stakeholders.” Proceedings of the 122nd ASEE Annual Conference and Exposition, Seattle, Washington, June 14 – 17, 2015.
5. **D. Delaine**, J.R. Cardoso, J. Walther. “A Boundary Spanner Intervention for Increasing Community Engagement Outcomes – Phase 1: Framing Case Studies in Context.” Proceedings of the World Engineering Education Forum 2014, Dubai, United Arab Emirates.
6. **D. Delaine**, et. al. “Comunidade de especialistas como referência para superar os desafios acadêmicos na criação de um grupo de pesquisas em educação em engenharia.” Proceedings of the XLII Congresso Brasileiro de Educação 2014.

7. D. Hansberry, **D. Delaine**, D. McEachron, E. Papazoglou, F. Allen, “Who are our students: A multiassessment approach to categorizing an undergraduate biomedical engineering student population”. Proceedings of the 9th Annual LACCEI Conference, Medellin, Colombia, August 2011.
8. D. McEachron, E. Papazoglou, F. Allen, **D. Delaine**, D. Hansberry, M. Sualp. “Engineering Education in Context: An Evidence Based Evaluation System”, ASEE Global Colloquium on Engineering Education, Singapore, Singapore, October 2010.
9. J. O’Shea, **D. Delaine**, “The Rise of Student-to-Student Learning – Youth-led Programs Impacting Engineering Education Globally”, *Proceedings of the IEEE Educon 2011*. Amman, Jordan, 04-06 April, 2011.
10. J. O’Shea, **D. Delaine**, J. DeBoer “Developing Leadership Skills Through Student-Led Initiatives: Student Platform for Engineering Education Development”, SEFI 2010 Annual Conference.
11. D. McEachron, F. Allen, G. Papazoglou, **D. Delaine**, “Engineering Education in Context: An Evidence-Based Intervention System” *Proceedings of the 2010 ASEE Annual Conference and Exposition*, Louisville, Kentucky, 2010.
12. **D. Delaine** et. Al, “Student involvement as a vehicle for empowerment: a case study of the student platform for engineering education development”, *European Journal of Engineering Education* – Special Issue: Best Papers from the SEFI 37th annual conference 2009, Vol. 35, Issue 4, 2010.
13. **D. Delaine** et al. “The Student Platform for Engineering Education Development (SPEED) Empowering the Global Engineer” SEFI Annual Conference, Rotterdam, Netherlands, August 2009. Nominated – Best Paper Award.
14. A. Fox, **D. Delaine**, A.K. Fontecchio, “Development of Non-Traditional Skills in Graduate Students Through Teaching and Curriculum Design”, *Proceedings of the 2009 ASEE Annual Conference and Exposition*, Austin, Texas, 2009.
15. **D. Delaine**, A. K. Fontecchio, “Social Networking Websites for Increased Success in Minority Science and Engineering Programs”, Proceedings of the 2009 ASEE Annual Conference and Exposition, Austin, Texas, 2009.
16. **D. Delaine**, L. Emelle, et al., “Student Run Outreach Programs for Professional Development and Increased Pre- Collegiate Participation”, Proceedings of the 7th ASEE Global Colloquium on Engineering Education, Cape Town, South Africa, 2008.
17. H. J. Shah, **D. Delaine**, and A. K. Fontecchio, “Plasma Modification of Fluoropolymers for Aligning Liquid Crystals”, *J. Display Technology* Volume 4, Issue 2, June 2008.
18. H. J. Shah, **D. Delaine**, and A. K. Fontecchio, “Liquid Crystal Alignment on Corona Patterned Polymer Films”, *J. Display Technology*. 15(8), 579, 2007.

Honors and Awards

- Postdoctoral Fellowship - Fundação de amparo à pesquisa do estado de são paulo (FAPESP)
- Fulbright scholar award postdoctoral fellowship – awarded fellowship for “assessing the impact of one boundary spanner on university-wide stem educational engagement” at the university of São Paulo.
- National Science Foundation Graduate Research Fellow
- National Science Foundation Bridge to the Doctorate Fellow.
- Ralph J. Bunche scholar throughout undergraduate education.

Inter-Institutional Collaborations

- University of Georgia Collaborative Lounge for Understanding Society and Technology (CLUSTER)
- Poli-Edu – Research Group in Engineering Education, Universidade de São Paulo Escola Politécnica
- The International Federation of Engineering Education Societies
- UNESCO Engineering Programme
- The University of Maryland Baltimore County and the Greater Philadelphia Region Louis Stokes Alliances for Minority Participation

Emily Dringenberg, Ph.D.

Assistant Professor

Department of Engineering Education

The Ohio State University, Hitchcock Hall, 2070 Neil Ave., Columbus, Ohio 43210-1057

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Education

Ph.D. Engineering Education, 2015. Purdue University, West Lafayette, IN.
M.S. Industrial Engineering, 2014. Purdue University, West Lafayette, IN.
B.S. Mechanical Engineering, 2008. Kansas State University, Manhattan, KS.

Employment History

Assistant Professor, Department of Engineering Education, The Ohio State University, Columbus, OH (2017-present).
Teaching Assistant Professor, General Engineering, Kansas State University, Manhattan, KS (2016-2017).
Instructor, General Engineering, Kansas State University, Manhattan, KS (2015-2016).
NSF Graduate Research Fellow, Engineering Education, Purdue University, West Lafayette, IN (2012-2015)
Graduate Professional Assistant, Women in Engineering, Purdue University, West Lafayette, IN (2011-2012)
High School Teacher, Engineering and Mathematics, Grady HS, Atlanta, GA (2009-2011)

Courses Taught at Kansas State University (KSU), Manhattan, KS

1. Engineering Orientation (DEN 160)
2. Engineering Problem Solving (DEN 161)
3. Engineering Decision Making (DEN 301)

Graduate student advising:

- Masters students advised: 1 graduated (Mechanical Engineering)

Publications (Summary):

- Peer-reviewed journal articles: 1
- Peer Reviewed proceedings and abstracts: 10
- Chapters in edited books: 1

Publications

Fila, N. D., Hess, J. L., Purzer, S., & **Dringenberg, E.** (2016). Engineering Students' Utilization of Empathy during a Non-Immersive Conceptual Design Task. *International Journal of Engineering Education*, 32(3B).

Purzer, S., Moore, T. J., Dringenberg, E. (In press). Cognition and engineering: Learning transfer and knowledge building. In Y. J. Dori & D. Baker (Eds.), *Cognition, metacognition, and culture in STEM education*. Springer.

Vesper, M., **Dringenberg, E.** (2016). The Implementation and Preliminary Impact of Intrusive Advising and an Academic Peer-Mentoring Program for Engineering Students. *Proceedings of the American Society for Engineering Education Midwest Regional Conference, Manhattan, KS*.

Dringenberg, E., Wertz, R. E. H. (2016). Work in Progress: How Do First-Year Engineering Students Experience Ambiguity in Engineering Design Problems: The Development of a Self-Report Instrument. *Proceedings of the American Society for Engineering Education Annual Conference and Exposition, New Orleans, LA*.

Dringenberg, E., Mendoza-Garcia, J. A., Tafur, M., Hsu, M., Fila, N. (2015). Using Phenomenography: What are Key Considerations when Selecting a Specific Research Approach? *Proceedings of the American Society for Engineering Education Annual Conference and Exposition, Seattle, WA*.

Chua, M., **Dringenberg, E.** (2014). Work In Progress: The Quest for the Mythical Phoenix: Attendee Narratives at an Engineering Education Faculty Workshop. *Proceedings of the Frontiers in Education Annual Conference, Madrid, Spain*.

- Dringenberg, E.,** Chua, M. (2014). What Can Reflections From an "Innovation in Engineering Education" Workshop Teach Workshop Designers and New Faculty? *Proceedings of the American Society for Engineering Education Annual Conference and Exposition, Indianapolis, IN.*
- Dringenberg, E.** (2014). First Year Students' Understanding of Normal Distributions: A Preliminary Study of Previous Exposure, Self-Efficacy and Content Knowledge. *Proceedings of the American Society for Engineering Education IL-IN Regional Conference, Terre Haute, IN.*
- Denick, D., **Dringenberg, E.,** Fayyaz, F., Nelson, L., Pitterson, N., Tolbert, D., Yatchmeneff, M., Cardella, M. (2013). STEM Thinking in Informal Environments: Integration and Recommendations for Formal Settings. In Proceedings of the *American Society for Engineering Education IL-IN Regional Conference, Angola, IN.*
- Dringenberg, E.,** Wertz, R. E. H., Purzer, S., & Strobel, J. (2012). Development of the Science and Engineering Classroom Learning Observation Protocol. In Proceedings of the *American Society for Engineering Education Annual Conference and Exposition, San Antonio, TX.*
- Dringenberg, E.,** Wiener, J., Purzer, S., Groh, J. (2012). Measuring the impact of engineering outreach on middle school students' perceptions. In Proceedings of the *American Society for Engineering Education IL-IN Regional Conference. Valparaiso, IN.*
- Mondisa, J., Fila, N., **Dringenberg, E.,** Zephirin, T. (2012). Work in Progress: A Case Study of the Types and Frequencies of Conflict in Engineering Design Dyads. In *Proceedings of the Frontiers in Education Annual Conference, Seattle, WA.*

Invited Talks

- Mestrovich Seay, A., **Dringenberg, E.** (February 8, 2017) Implicit Bias & De-biasing Strategies in Action. Professional development for K-State Research and Extension Agents. Kansas State University. Manhattan, KS.
- Dringenberg, E.,** Baird, C., Tuttle, T. (October 24, 2016) Implicit Bias Panel. Guest panel for Caterpillar Inc. employees. Caterpillar Work Tools. Wamego, KS.
- Dringenberg, E.,** Betz, A. (June 3, 2016) Growth Mindset: How do your perceptions of intelligence help or hinder the teaching and learning environments that you create? Closing Plenary Session. Big XII Teaching and Learning Conference. Manhattan, KS.
- Dringenberg, E.** (February, 2016) Introduction to Implicit Bias. Guest lecture for the K-State Office for the Advancement of Women in Science and Engineering. Manhattan, KS.
- Dringenberg, E.** (October, 2015) Recognizing Patterns in Gender Bias. Women in Engineering seminar at Kansas State University. Manhattan, KS.

Honors and Awards

- Kansas State University Peer Review of Teaching Fellow, Mentor (2016, 2017)
- ASEE Midwest Section Best Paper (2016)
- K-State Faculty of the Month Nominee (2015) Fall 2015
- National Science Foundation Graduate Research Fellow (2011) Spring 2012
- AmeriCorps Academic Award, Teach For America Service Completion (2011) Spring 2011
- Teach for America Fellow, top 10% of 35,000 applicants nationwide (2009) Fall 2009
- "Outstanding Senior," selected by KSU Mechanical Engineering Faculty (2008) Fall 2008
- FE (Fundamentals of Engineering) Certification (2008) Fall 2008

Deborah M. Grzybowski, Ph.D.

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Department of Engineering Education
Department of Chemical and Biomolecular Engineering
The Ohio State University, 244 Hitchcock Hall, 2070 Neil Ave., Columbus, Ohio 43210-1057
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Education

Ph.D. Biomedical Engineering, 2000. The Ohio State University, Columbus, OH.
M.S. Chemical Engineering, 1982. The Ohio State University, Columbus, OH.
B.S. Chemical Engineering, 1979. The Ohio State University, Columbus, OH.

Employment History

Associate Professor Clinical, Department of Engineering Education, The Ohio State University, Columbus, OH (2016-present).
Associate Professor Clinical, Department of Chemical and Biomolecular Engineering (CBE), The Ohio State University, Columbus, OH (2012-present).
Scientific Advisor, Executive Board of Directors member, The Ohio Lions Eye Research Foundation, Columbus, OH (2011-present).
Assistant Professor Clinical, Engineering Education Innovation Center, College of Engineering, The Ohio State University, Columbus, OH (2012-2015).
Assistant Professor, The Department of Ophthalmology, The Ohio State University, College of Medicine, Columbus, OH (2003-2012).
Director Ohio Lions Eye Research Facility, The Department of Ophthalmology, The Ohio State University, College of Medicine, Columbus, OH (2003-2012).
Research Scientist, The Department of Ophthalmology, The Ohio State University, College of Medicine, Columbus, OH (2002-2003).
Post-Doctoral Fellow, The Department of Biomedical Engineering, The Ohio State University, College of Engineering, Columbus, OH (2000-2002).
French Fellow, Department of Engineering Graphics, The Ohio State University, College of Engineering, Columbus, OH (1992-1999).
Principal Research Scientist, Battelle Memorial Institute, Columbus, OH (1982-1992).

Courses Taught at the Ohio State University (OSU), Columbus, Ohio

1. Fundamentals of Engineering II for Honors – Robot Option (ENGR 1282.01H)
2. Fundamentals of Engineering II for Honors – Nanotechnology Option (Course Director) (ENGR 1282.02H)
3. Bio-Engineering for students with Visual Impairments I (Developed Course) (EDUTL 5992)
4. Fundamentals of Engineering I for Honors (ENGR 1281.01H)
5. Bio-Engineering for students with Visual Impairments II (Developed Course) (EDUTL 5992)
6. Engineering Fundamental and Laboratory I for Honors (ENGR 191)
7. Engineering Fundamental and Laboratory II for Honors (ENGR 192)
8. Introduction to Engineering I (ENGR 181)
9. Graphics 167 MATLAB (ENGR 167)
10. Engineering Fundamental and Laboratory III for Honors – Robot Option (ENGR 193, previously ENGR 168)
11. Engineering Fundamental and Laboratory III for Honors - Nanotechnology Option (ENGR 193A)

Graduate student advising:

- PhD students advised: 3 graduated (2 BME, 1 CBE)
- Masters students advised: 2 graduated (2 BME)
- Post-Doctoral students advised: 2
- Medical Student research programs advised: 52
- Ophthalmology Resident student research programs advised: 26
- Undergraduate Research programs advised: 24

Graduate Student Committees:

- PhD students: 1 graduated (CEGE), 1 current (CEGE)
- Masters students: 2 graduated (CEGE)
- Undergrad Honors Thesis: 1 graduated (BME)

Publications (Summary):

- Peer-reviewed journal articles: 19
- Proceedings and abstracts: 115 (115 peer-reviewed)
- Chapters in edited books: 2
- Bulletins, tech reports, and fact sheets: 2
- Invited speaker at workshops, conferences, and symposiums: 26

Selected recent publications (Engineering education related):

1. Wild, T., **Grzybowski, D.M.**, Yang, S.J., Upton, J. “Engineering Education for Teachers of Students with Visual Impairment Professional Development Program”, *J. Visual Impairment & Blindness*, in review.
2. Dixon, K., **Grzybowski, D.M.**, Le, J.V., Castro, C.E. “Engaging Adolescent Girls in Engineering by Integrating Visual Art into DNA Origami Content”, *Journal of Engineering Education*, in review.
3. Dixon, K., Barton, M., Le, J.V., Castro, C.E., Richardson, O.R., **Grzybowski, D.M.** “Making Meaning through Art-Integrated Engineering.” 2017 American Society for Engineering Education Annual Conference, Columbus, OH, June 2017.
4. **Grzybowski, D.M.**, Wild, T., Yang, S.J. “Engineering Education for Students with Visual Impairments.” 2017 American Society for Engineering Education Annual Conference, Columbus, OH, June 2017.
5. Wild, T., **Grzybowski, D.M.**, Yang, S.J. “EEVI: Engineering Education for Students with Visual Impairments.” Council for Exceptional Children, Boston, MA, April 20, 2017.
6. **Grzybowski, D.M.**, Wild, T. “EEVI: Engineering Education for Students with Visual Impairments.” National Science Teachers Association, Columbus, OH, December 1, 2016.
7. Bannerman, R., Theiss, A. & **Grzybowski, D.M.** “MAKER: Utilizing 3D Printing of Nanotechnology Design Project Prototypes to Enhance Undergraduate Learning.” 2016 American Society for Engineering Education Annual Conference, New Orleans, LA, June 2016.
8. Dixon, K. & **Grzybowski, D.M.** “Design as the Practice of Probability: Engaging Adolescent Girls in Art-Infused Engineering.” 2016 American Society for Engineering Education Annual Conference, New Orleans, LA, June 2016.
9. Cohen, W., Freuler, R.J., & **Grzybowski, D.M.** “MAKER: Applications of 3D Printing and Laser Cutting in Development of Autonomous Robotics.” 2016 American Society for Engineering Education Annual Conference, New Orleans, LA, June 2016.
10. **Grzybowski, D.M.** and J.T. Demel. “Assessment of Inverted Classroom Success Based on Felder’s Index of Learning Styles.” 2015 American Society for Engineering Education Annual Conference, Seattle, WA, June 2015.
11. **Grzybowski, D.M.**, Stavrdis, O., Sorby, S.A., Merrill, J., Thomas, J.G., Barclay, L., Abrams, L. “Impact of Optional Supplemental Course to Enhance Spatial Visualization Skills in First-Year Engineering Students.” 2014 American Society for Engineering Education Annual Conference, Indianapolis, IN, June 2014.
12. Spang, M.T., **Grzybowski, D.M.**, Strickland, A. A. “Works in Progress: Impact of First-Year Micro-/Nano-Technology Research Project Course on Future Research and Graduate/Professional School Involvement.” 2014 American Society for Engineering Education Annual Conference, Indianapolis, IN, June 2014.
13. Kecskemety, K., **Grzybowski, D.M.** “Student Perceptions of Inverted Classroom Benefits in a First-Year Engineering Course.” 2014 American Society for Engineering Education Annual Conference, Indianapolis, IN, June 2014.
14. Hird, N.L. and **Grzybowski, D.M.** “Impact of Computational Fluid Dynamics use in a First-Year Engineering Research Design Project on Future Performance in Fluid Mechanics.” 2014 American Society for Engineering Education Annual Conference, Indianapolis, IN, June 2014.

15. Harper, K.A., Baker, G.R, and **Grzybowski, D.M.** “First Steps in Strengthening the Connections Between Mathematics and Engineering.” 2013 American Society for Engineering Education Annual Conference, Atlanta, GA, June 25, 2013.
16. Tague, J., Czocher, J.A., Baker, G.R., Harper, K.A., **Grzybowski, D.M.**, and Freuler, R. “Engineering Faculty Perspectives on Mathematical Preparation of Students.” International Conference on Engineering Education and Research 2013, Marrakech, Morocco, July 2013.
17. **Grzybowski, D.M.**, Abernathy, S., Boyd, A.C., Cain, D., Hird, N.L., Madhavan, R.R., Shi, Y., Spang, M.T., Strickland, A.A., and Clingan, P.A. “Student Assisted Approach to Curriculum Changes to Facilitate a Flipped Classroom for First-Year Engineering Micro-/Nano-technology 'Lab-on-a-chip' Research Project.” International Conference on Engineering Education and Research 2013, Marrakech, Morocco, July 2013.

Honors and Awards

- Recipient Sphinx/Mortar Board Faculty Award (2014)
- STEP Faculty Member (2013 – present)
- Recipient of Faculty Award for Outstanding Commitment to Student Education, Panhellenic Association (2012)
- Member Executive Board, Scientific Advisor, The Ohio Lions Eye Research Foundation (2011 – present)
- ISTAART ICAD Travel Fellowship (2008)
- Society for Research in Hydrocephalus and Spinal Bifida Travel Award (2008)
- Intracranial Hypertension Research Foundation Scientific Advisory Panel (2006 – present)
- The BrainChild Steering Committee (2006 – present)
- Recipient Landacre Faculty Teaching Award (2005)
- Association for Research in Vision and Ophthalmology Travel Award (2004)
- CIC Women in Science and Engineering Travel Grant (1998)
- French Fellowship Recipient (1992 – 1999)
- Graduate Fellow; Tau Beta Pi; Sigma Delta Epsilon; Texnikoi; Outstanding Senior in Chemical Engineering Award, The American Institute of Chemists; Outstanding Freshman Award, Outstanding Freshman Chemistry Award, CRC. (1976-1982)

Panel Member

- NSF Biomedical Engineering Panel 2013 & 2014 NSF Graduate Research Fellowship Program (GRFP)
- National Sciences and Engineering Research Council of Canada, Collaborative Health Research Projects, 2011.
- Alzheimer’s Association, 2009, 2010, 2011
- NIH Neurotransmitters, Receptors, Channels, and Calcium Signaling Study Section; 2/2011
- NIH ZRG1 ETTN-K (10) B - Small Business: Clinical Neurophysiology, Devices, Auditory Devices and Neuroprosthesis; 10/2011

Selected Sponsored Research (Approximate Total Funding Received \$1,290,000)

1. “Engineering Education for Students with Visual Impairments (EEVI) Project,” Principal Investigator, Ohio Department of Education, MSP Program, \$593,193; 2015-2017.
2. “smART::ART Integrated Formal and Informal STEM Education,” Principal Investigator, OSU Engagement Impact Grant, \$45,000; 2015-2017.
3. “smART: Spatial Visualization and Creativity in Middle School Engineering,” Co-Investigator, Battelle Community STEM Challenge Grant, \$53,000; 2015-2017.
4. “1282.02H OSU Library Course Enhancement Grant,” Principal Investigator, \$2,000; 2012-2013.

Inter-institutional collaborations

- Manchester University (co-author)
- Brown University (co-author)
- Duke University (co-author, co-PI)
- ETH Zurich (co-author)

APPENDIX 2a: Program Goals, Learning Outcomes, and Levels of Proficiency

Table 1. Goal #1 with Program Outcomes and Levels of Proficiency

Program Goals	Program Outcomes	Levels of Proficiency (B= Basic, I = Intermediate, A= Advanced)
1. Identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs	1.A. Engage critical issues in the field with attention to inclusion of multiple perspectives and demographics	1.A.(B) Identify several of the contemporary educational issues with attention to inclusion of multiple perspectives and demographics
		1.A.(I) Discuss the main perspectives of contemporary educational issues and describe impact on stakeholders with attention to inclusion of multiple perspectives and demographics.
		1.A.(A) Develop and execute a plan to address educational issues with attention to inclusion of multiple perspectives and demographics
	1.B. Analyze the history and foundations of the education of engineers and the discipline of engineering education in US and international contexts	1.B.(B) Identify broad historical and foundational aspects of engineering education in US and international contexts.
		1.B.(I) Discuss key historical and foundational aspects of engineering education related to contemporary issues in US and international contexts.
		1.B.(A) Synthesize relevant educational history and foundations of critical contemporary issues in US and international contexts.
	1.C. Characterize potential stakeholders and design appropriate engagement strategies	1.C.(B) Identify primary stakeholders of engineering education.
		1.C.(I) Explain relationships among stakeholders and contemporary educational issues.
		1.C.(A) Define appropriate engagement strategies with stakeholders.
	1.D. Identify and interpret stakeholder needs to develop action plans	1.D.(B) Describe several relevant stakeholder needs.
		1.D.(I) Interpret stakeholder needs in relationship to engineering education.
		1.D.(A) Create an action plan to address one or more stakeholder needs.
	1.E. Contribute to high-impact efforts to use and/or transform engineering education to best meet stakeholder needs	1.E.(B) Actively participate in an effort that leads to specific application or transformation of engineering education to meet stakeholder needs.
		1.E.(I) Lead an effort grounded in theory of change to transform engineering education to best meet stakeholder needs.
		1.E.(A) Translate high-impact effort into scholarship.

Table 2. Goal #2 with Program Outcomes and Levels of Proficiency

Program Goals	Program Outcomes	Levels of Proficiency (B= Basic, I = Intermediate, A= Advanced)
2. Design, conduct, and critique research in engineering education	2.A. Research with attention to inclusion of multiple perspectives and demographics so that research outcomes are more universally relevant	2.A.(B) Identify ways that diverse populations may be impacted negatively and positively by research.
		2.A.(I) Reflect critically on research across various fields that targets diverse audiences.
		2.A.(A) Expand the body of knowledge in engineering education with attention to inclusion of multiple perspectives and demographics.
	2.B. Demonstrate awareness of broadly applicable research opportunities, funding, resources, and communications (internal and external to the field)	2.B.(B) Identify current research opportunities and communications within and outside of engineering education.
		2.B.(I) Distinguish between types of resources and funding available and the corresponding reporting expectations.
		2.B.(A) Select appropriate research opportunities, funding, resources, and communications that aligns with one's research interests and expertise.
	2.C. Construct appropriate research questions in engineering education that address stakeholder needs and advance the field	2.C.(B) Identify appropriate, researchable questions considering relevant literature that address stakeholder needs and advance the field.
		2.C.(I) Appraise whether research questions appropriately align with an overall research study design, address stakeholder needs, and advance the field and contributes to larger body of knowledge in engineering education.
		2.C.(A) Develop sound engineering education research questions that address stakeholder needs and advance the field.
	2.D. Design research that uses appropriate and evidence-based methods	2.D.(B) Define qualitative, quantitative, and mixed methods commonly used within and outside of engineering education research.
		2.D.(I) Select appropriate methods to research questions.
		2.D.(A) Propose a comprehensive research project that uses a sound methodological design.
	2.E. Collect, analyze, and interpret data using appropriate techniques	2.E.(B) Collect, analyze, and interpret data within a given set of research parameters
		2.E.(I) Collect, analyze, and interpret data for a comprehensive research project
		2.E.(A) Defend the collection, analysis, and interpretation of data from a comprehensive research project

Program Goals	Program Outcomes	Levels of Proficiency (B= Basic, I = Intermediate, A= Advanced)
2. Design, conduct, and critique research in engineering education <i>(continued)</i>	2.F. Communicate results of research efforts in traditional and non-traditional forms	2.F.(B) Differentiate among and select types of dissemination venues for research.
		2.F.(I) Assess when research is appropriate for submission to identified venues.
		2.F.(A) Publish in a peer-reviewed dissemination outlet.
	2.G. Critique the quality of engineering education research studies of various types presented in different forms	2.G.(B) Identify quality indicators of research.
		2.G.(I) Evaluate the quality of a selected scholarly effort.
		2.G.(A) Serve as a peer reviewer of research studies for an appropriate dissemination venue.
	2.H. Analyze how a broad array of research projects integrate into the field.	2.H.(B) Recognize prior research conducted in an area of interest.
		2.H.(I) Determine how to make connections across research themes to identify gaps in literature.
		2.H.(A) Propose a research agenda informed from a synthesis of existing literature and research across multiple fields.
	2.I Structure, manage, and implement research projects.	2.I.(B) Define the aspects of research project management.
		2.I.(I) Develop a structured plan to manage a research study for implementation.
		2.I.(A) Execute a research project and reflect on the execution of that project.

Table 3. Goal #3 with Program Outcomes and Levels of Proficiency

Program Goals	Program Outcomes	Levels of Proficiency (B= Basic, I = Intermediate, A= Advanced)
3. Demonstrate, value, and apply engineering expertise	3.A. Apply an engineering mindset to devise solutions to complex problems with attention to inclusion of multiple perspectives and demographics.	3.A.(B) Discuss solutions to complex problems with attention to inclusion of multiple perspectives and demographics.
		3.A.(I) Discern the impact of engineering solutions with attention to inclusion of multiple perspectives and demographics.
		3.A.(A) Develop an engineering solution to a complex problem with attention to inclusion of multiple perspectives and demographics.
	3.B. Demonstrate engineering competence in at least one specific domain.	3.B.(B) Define an engineering problem and discuss multiple solutions within selected domain
		3.B.(I) Assess integrity of an engineering solution using design criteria within a selected domain
		3.B.(A) Create and validate an engineering solution within selected domain
	3.C. Formulate applications of engineering education to engineering practice and vice versa.	3.C.(B) Discuss a novel solution and translate language to and from engineering and engineering education settings
		3.C.(I) Design and propose a novel solution to and from engineering and engineering education settings
		3.C.(A) Synthesize outcomes from an engineering solution into an engineering education setting and vice versa
	3.D. Identify pathways for lifelong learning in engineering.	3.D.(B) Discuss opportunities for continued learning in engineering.
		3.D.(I) Propose a professional development agenda illustrating pathways for lifelong learning in engineering.
		3.D.(A) Demonstrate engagement within opportunities for lifelong learning in engineering.

Table 4. Goal #4 with Program Outcomes and Levels of Proficiency

Program Goals	Program Outcomes	Levels of Proficiency (B= Basic, I = Intermediate, A= Advanced)
4. Create, teach, and assess courses and curricula	4.A. Educate with attention to inclusion of multiple perspectives and demographics so that every student has the opportunity to learn	4.A.(B) Discuss student and teacher similarities and differences across multiple perspectives and demographics
		4.A.(I) Experiment with different teaching techniques to engage multiple perspectives and demographics so that every student has the opportunity to learn
		4.A.(A) Engage all students in a given educational experience so that every student has the opportunity to learn.
	4.B. Design a course or other significant educational experience founded in learning theory explicitly addressing stakeholder needs	4.B.(B) Build a lesson plan addressing stakeholder needs.
		4.B.(I) Critique an existing course syllabus using learning theory.
		4.B.(A) Develop a course syllabus and discuss the choices made founded in learning theory explicitly addressing stakeholder needs.
	4.C. Analyze how multiple courses integrate into a curriculum	4.C.(B) Evaluate a course's significance and effectiveness in the context of other courses in a curriculum.
		4.C.(I) Synthesize a set of courses' impact on students' learning across a curriculum.
		4.C.(A) Propose curricular adjustments to address gaps in achieving learning outcomes.
	4.D. Instruct a course or other significant educational experience using appropriate and evidence-based pedagogical techniques	4.D.(B) Observe a course or other significant educational experience, highlighting the various techniques used and their appropriateness to the context.
		4.D.(I) Teach effectively a course or other significant educational experience.
		4.D.(A) Use appropriate and evidence-based pedagogical techniques while teaching a course.

Program Goals	Program Outcomes	Levels of Proficiency (B= Basic, I = Intermediate, A= Advanced)
4. Create, teach, and assess courses and curricula <i>(continued)</i>	4.E. Assess and improve their own teaching through informed, inquiry-based practice	4.E.(B) Reflect on one's teaching experiences highlighting strengths and areas for improvement
		4.E.(I) Critique different examples of teaching, highlighting the various techniques used and their appropriateness to the context.
		4.E.(A) Gather and apply teaching feedback.
	4.F. Develop effective tools to evaluate learning	4.F.(B) Create appropriate learning outcomes.
		4.F.(I) Develop tools that measure learning outcomes at various levels.
		4.F.(A) Revise tools and learning outcomes based on experiences and student feedback.
	4.G. Evaluate and improve student learning responsibly, equitably, and in alignment with learning outcomes	4.G.(B) Identify students' level of knowledge, skills, and abilities responsibly, equitably, and in alignment with learning outcomes.
		4.G.(I) Determine students' difficulties in alignment with various learning outcomes.
		4.G.(A) Develop responsible and equitable strategies to assist students in their learning that align with learning outcomes
	4.H. Design and implement evaluations/assessments of a variety of educational programming	4.H.(B) Describe the differences and similarities between assessment and evaluation.
		4.H.(I) Critique an educational program using appropriate assessment and evaluation tools.
		4.H.(A) Develop a tool to assess and evaluate the effectiveness of an educational program.

Table 5. Goal #5 with Program Outcomes and Levels of Proficiency

Program Goals	Program Outcomes	Levels of Proficiency (B= Basic, I = Intermediate, A= Advanced)
5. Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits	5.A. Engage in professional activities with attention to inclusion of multiple perspectives and demographics in order to create synergy in the midst of differences.	5.A.(B) Reflect with curiosity about what can be learned from communities and cultures with attention to inclusion of multiple perspectives and demographics in order to create synergy in the midst of differences.
		5.A.(I) Demonstrate evidence of adjustment in attitudes and beliefs through working within and learning from diverse communities and cultures.
		5.A.(A) Promote others' engagement with diversity.
	5.B. Demonstrate a mindset that values curiosity and questioning, finds and leverages connections across a wide range of ideas, and creates positive societal value	5.B.(B) Discuss the diverse and rapidly changing world from more than one field of study or perspective with curiosity about potential positive societal values.
		5.B.(I) Connect examples, facts, or theories from more than one field of study or perspective and describe how positive societal value is created.
		5.B.(A) Synthesize conclusions by combining examples, facts, or theories from more than one field of study or perspective which create positive societal value .
	5.C. Function effectively on diverse, multidisciplinary teams	5.C.(B) Discuss the elements of effective teamwork and importance of diverse, multidisciplinary teams.
		5.C.(I) Participate effectively on a diverse, multidisciplinary team.
		5.C.(A) Manage a diverse, multidisciplinary team.
	5.D. Communicate effectively with a range of audiences using multiple modes and media	5.D.(B) Explain the appropriate communication strategies to use with a range of audiences using multiple modes and media.
		5.D.(I) Critique specific communications considering a range of potential audiences.
		5.D.(A) Disseminate/publish appropriate to target audience(s) using multiple modes and media.
	5.E. Recognize, analyze, and equitably engage with professional ethical dilemmas	5.E.(B) Recognize complex, multi-layered professional ethical dilemmas.
		5.E.(I) Critique appropriate perspectives and theories used to analyze professional ethical dilemmas, considering full implications.
		5.E.(A) Apply appropriate perspectives and theories to engage professional ethical dilemmas including assumptions and implications, equitably defending trade-offs.

Program Goals	Program Outcomes	Levels of Proficiency (B= Basic, I = Intermediate, A= Advanced)
5. Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits <i>(continued)</i>	5.F. Demonstrate effective leadership skills	5.F.(B) Discuss the elements of effective leadership skills, including self-awareness, resource management, and motivating others.
		5.F.(I) Critique leadership skills of select individuals, considering visioning, conflict and resource management, and mentoring.
		5.F.(A) Apply effective leadership skills.
	5.G. Apply appropriate principles to manage teams and projects	5.G.(B) Describe the project management process and primary constraints including scope, schedule, budget, and quality.
		5.G.(I) Critique project management from a variety of sectors including education, development, and industry.
		5.G.(A) Implement the project management process for a comprehensive project
	5.H. Demonstrate empathy and cultural competence across professional interactions	5.H.(B) Identify components of multiple cultural perspectives.
		5.H.(I) Demonstrate empathetic connection to the complexity of elements important to multiple cultures.
		5.H.(A) Promote empathy and cultural competence across professional interactions.
	5.I. Prepare professional documents and demonstrate effective communication skills appropriate to a variety of job search and career advancement processes	5.I.(B) Describe documents prepared regularly in professional career contexts and identify quality indicators of each.
		5.I.(I) Prepare documents and demonstrate effective communication skills appropriate to a variety of job search and career advancement processes .
		5.I.(A) Solicit feedback from multiple sources and revise professional documents appropriate to career goals.
5.J. Value and demonstrate commitment to continuing education and lifelong learning	5.J.(B) Describe multiple continuing education learning experiences explaining the value of lifelong learning.	
	5.J.(I) Develop and pursue plans for lifelong learning to support career goals.	
	5.J.(A) Promote and contribute to knowledge and experiences of peers which provide foundation for expanded knowledge, growth, and maturity over time.	

Appendix 2b. Curriculum Map for Engineering Education PhD program

Program Goals & corresponding Learning Outcomes	Required Courses							Elective Courses	Co-Curricular Milestones									
	6100	6200	7790	7189.01	7881	7189.02	7900		Prior Learning (admission standards)	Qualifying exam (written and oral)	Engineering portfolio or allegion equivalent	Proposal and Candidacy (written and oral)	Annual Review			Dissertation Document	Dissertation Oral Defense	
	Foundations	Learning Theory, pedagogy, assessment	Research methods	Practicum 1	Seminar	Practicum 2	Professional development						Teaching opportunities	Specialization	Individual learning research group			Dissertation Research
1. Identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs	A. Engage critical issues in the field with attention to inclusion of multiple perspectives and demographics	B	B/I	B/I	I		I		I		I				A	A	A	I
	B. Analyze the history and foundations of the education of engineers and the discipline of engineering education in US and international contexts	B/I	B/I			I		I/A		I						A	A	I/A
	C. Characterize potential stakeholders and design appropriate engagement strategies	B/I	B/I			I		B/I/A		I		A			I/A	I/A	I/A	I/A
	D. Identify and interpret stakeholder needs to develop action plans	B/I	B			I		B/I/A				B			I/A	I/A		
	E. Contribute to high impact efforts to use and/or transform engineering education to best meet stakeholder needs			B	B		B					B			I/A	I/A	I/A	I
2. Design, conduct, and critique research in engineering education	A. Research with attention to inclusion of multiple perspectives and demographics so that research outcomes are more universally relevant	B		B/I	I				I		I				I	A	A	A
	B. Demonstrate awareness of broadly applicable research opportunities, funding, resources, and communications (internal and external to the field)			B	B		I/A				A				I/A			
	C. Construct appropriate research questions in engineering education that address stakeholder needs and advance the field	B		B/I/A	I				I/A		A				A	A	A	A
	D. Design research that uses appropriate and evidence-based methods			B/I					I		A				I/A	A	A	A
	E. Collect, analyze, and interpret data using appropriate techniques			B					I		I				A	A	A	A
	F. Communicate results of research efforts in traditional and non-traditional forms	B		B			B				B/I				I/A	I/A	A	A
	G. Critique the quality of engineering education research studies of various types presented in different forms	B/I	B/I	B/I	I				I		I			A	I			
	H. Analyze how a broad array of research projects integrate into the field	B		B	I			A			I				B/I	A	A	I
	I. Structure, manage, and implement research projects			B/I							I				B/I/A	A	A	A
3. Demonstrate, value, and apply engineering expertise	A. Apply an engineering mindset to devise solutions to complex problems with attention to inclusion of multiple perspectives and demographics								B/I		B/I/A							
	B. Demonstrate engineering competence in at least one specific domain								B/I		B/I/A							
	C. Formulate applications of engineering education to engineering practice and vice versa		B/I		B	I							I/A		B	I/A	I/A	I/A
	D. Identify pathways for lifelong learning in engineering							I/A	B		B/I				B			

NOTES: Letter (B, I, A) indicates level of highest proficiency attainment in that course or curricular element:
 "B" = BASIC skills encompassing knowledge and comprehension of subject matter
 "I" = INTERMEDIATE skills encompassing application of knowledge to analyze a problem
 "A" = ADVANCED skills encompassing ability to evaluate, judge, and synthesize information

Proposal for PhD in Engineering Education

Program Goals & corresponding Learning Outcomes		Required Courses						Elective Courses	Co-Curricular Milestones										
		8100	6280	7780	7189.01	7881	7189.02	7900		Prior learning (acceleration standards)	Qualifying exam (written and oral)	Engineering portfolio ± (MEng. or equivalent)	Proposal and Candidacy (written and oral)	Annual Review			Dissertation Document	Dissertation Oral Defense	
		Foundations	Learning theory, pedagogy, assessment	Research methods	Practicum 1	Seminar	Practicum 2	Professional development					Teaching opportunities	Specialization	Individual learning research group	Dissertation Research			
4. Create, teach, and assess courses and curricula	A. Educate with attention to inclusion of multiple perspectives and demographics so that every student has the opportunity to learn		B/I		A		A												
	B. Design a course or other significant educational experience founded in learning theory explicitly addressing stakeholder needs		I/A		B		I												
	C. Analyze how multiple courses integrate into a curriculum		B/I/A		B		A							B/A					
	D. Instruct a course or other significant educational experience using appropriate and evidence-based pedagogical techniques		B		I/A		A								I/A				
	E. Assess and improve their own teaching through informed, inquiry-based practices		B/I		B/I		A								B/I/A				
	F. Develop effective tools to evaluate learning		B/I		I		A				B/I				I/A				
	G. Evaluate and improve student learning responsibly, equitably, and in alignment with learning outcomes				B/I		I/A								B/I/A				
H. Design and implement evaluation/assessments of a variety of educational programming		B/I		B		I/A				I									
5. Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits	A. Engage in professional activities with attention to inclusion of multiple perspectives and demographics in order to create synergy in the midst of differences.				B	I	B/I	B							B/I	A	A	A	A
	B. Demonstrate a mindset that values curiosity and questioning, finds and leverages connections across a wide range of ideas, and creates positive societal value	B/I	B/I				A				I	I	A			A	A	A	A
	C. Function effectively on diverse, multidisciplinary teams			B	I		I	B						I/A	A				
	D. Communicate effectively with a range of audiences using multiple modes and media		B/I	B/I		B/I/A		I/A						B		I	A	A	A
	E. Recognize, analyze, and equitably engage with professional ethical dilemmas	B/I	B/I	B		A					I					A	A		A
	F. Demonstrate effective leadership skills				B		I	B/I							A		A		
	G. Apply appropriate principles to manage teams and projects			B				B/I								I	A		
	H. Demonstrate empathy and cultural competence across professional interactions	B	B		I		I	A			B		I	I		A	A	A	A
	I. Prepare professional documents and demonstrate effective communication skills appropriate to a variety of job search and career advancement processes					B		B/I/A				I				I/A		A	
J. Value and demonstrate commitment to continuing education and lifelong learning					B		B/I				I			A		A	I	A	A

NOTES: Letter (B, I, A) indicates level of highest proficiency attainment in that course or curricular element:
 "B" = BASIC skills encompassing knowledge and comprehension of subject matter
 "I" = INTERMEDIATE skills encompassing application of knowledge to analyze a problem
 "A" = ADVANCED skills encompassing ability to evaluate, judge, and synthesize information

APPENDIX 2c. Example semester-by-semester plans for students with and without M.S. engineering degrees at time of admission

Entering with a M.S. in Engineering
(Transfer 12 Engineering Credits)

	Autumn	Spring	Summer
Year 1	ENGREDU 7881 (1)	ENGREDU 7881 (1)	Diss (6)
	ENGREDU 6100 (3)	ENGREDU 6200 (3)	Elec (3)
	ENGREDU 7780 (3)	Research methods (3)	Qualifying Exam
	ENGREDU 7189.01 (2)	ENGREDU 7189.02 (1)	
		Diss (1)	
	9	9	9
Year 2	Research methods (3)	ENGREDU 7900 (3)	Diss (6)
	Elec (3)	Research methods (3)	Candidacy
	Elec (3)	Elec (3)	
	Diss (6)	Diss (6)	
	15	15	6
Year 3	Diss (3)	Diss (3)	
		Defense	
	3	3	

Entering with a B.S. in Engineering
(Transfer 0 Credits)

	Autumn	Spring	Summer
Year 1	ENGREDU 7881 (1)	ENGREDU 7881 (1)	Qualifying Exam
	ENGREDU 6100 (3)	ENGREDU 6200 (3)	
	ENGRED 7780 (3)	Engineering (3)	
	ENGREDU 7189.01 (2)	ENGREDU 7189.02 (1)	
	9	8	
Year 2	Research methods (3)	Research methods (3)	Diss (6)
	Engineering (3)	Elec (3)	
	Engineering (3)	Engineering (3)	
	Elec (3)	Diss (1)	
	9	10	6
Year 3	Elec (3)	ENGREDU 7900 (3)	Diss (6)
	Research methods (3)	Elec (3)	Candidacy
	Diss (6)	Diss (6)	
	12	12	6
Year 4	Diss (3)	Diss (3)	
		Defense	
	3	3	

DEPARTMENT OF ENGINEERING EDUCATION Ph.D. ADVISING SHEET
 Proposal for Ph.D. in Engineering Education
College of Engineering, The Ohio State University

Name:	OSU Student ID #:
Area of Study:	Admission Year:
Faculty Advisor:	Expected Graduation:

Minimum of 80 Graduate Credit Hours (may include up to 30 hours of transfer credit)

This form must be completed and submitted by the student to EED Graduate Studies Committee with his or her faculty advisor signature before the department can approve the Application to Graduate through the GRADFORMS.OSU.EDU system.

Transfer Credit

All transfer coursework MUST be approved by student's faculty advisor and have been completed within 6 years of the date of admission. For OSU Graduate Non-Degree courses, a limit of 7 semester hours may be transferred. For non-OSU graduate courses or a completed Master's degree, a maximum of 30 hours can be transferred. The Transfer of Graduate Credit form must be completed and submitted through the GRADFORMS.OSU.EDU system.

Institution	Course Number/Title	Date Transfer of Graduate Credit submitted	Units

Professional Engagement

*Each EED doctoral student is expected to complete an **Annual Evaluation** of professional and academic progress with his/her faculty advisor. See the EED Graduate Handbook for the process and expectations regarding student involvement in professional organizations, presentations, conferences, and publications.*

EED Core Ph.D. Requirements

Each EED doctoral student is required to complete the core coursework.

Course #	Course Title	Term/Year	Grade	Unit(s)
ENGREDU 6100	Foundations and the Field of Engineering Education			
ENGREDU 6200	Learning Theory, Pedagogy, and Assessment			
ENGREDU 7780	Engineering Education Research Methods			
ENGREDU 7881	Seminar			
ENGREDU 7900	Professional Development in Engineering Education			

Specialization Elective Courses

*Please refer to the **approved list of elective courses for each EED Specialization**. Other courses within or outside EED must be approved by your faculty advisor*

Course #	Course Title	Term/Year	Grade	Unit(s)

Engineering disciplinary requirement

Each EED doctoral student must complete at least twelve hours of traditional engineering coursework at the graduate (5000+) level.

Course #	Course Title	Term/Year	Grade	Unit(s)

Research Methods

*Each EED doctoral student is required to complete a minimum of 9 semester hours of Research Methods coursework, but faculty advisors may require more. Students may choose a qualitative, quantitative, mixed focus, or other research method approved by their faculty advisor. **ENGEDU 7780 is highly recommended prior to beginning a research sequence.***

Course #	Course Title	Term/Year	Grade	Unit(s)

Proposal for PhD in Engineering Education

Scholarly Teaching Practicum

The purpose of the Scholarly Teaching Practicum course sequence is to provide students with professional experiences of closing the research-practice loop in engineering education. Each doctoral student must complete **a minimum of 3 hours** of ENGREDU 7189. These are distinct from assistantship (i.e. GAA, GTA, or GRA) hours.

Course #	Course Title	Term/Year	Grade	Unit(s)
ENGREDU 7189.01	Engineering Education Practicum I			
ENGREDU 7189.02	Engineering Education Practicum II			

Candidacy Examination

Once all of the above course requirements are fulfilled, doctoral students should register for ENGREDU 7193 with his/her faculty advisor for **at least 2 consecutive terms** in preparation for the Candidacy Examination (no minimum number of credits required) and for **at least 3 credit hours of ENGREDU 7193 during the semester in which the candidacy examination is completed.**

Course #	Course Title	Term/Year	Grade	Unit(s)
ENGREDU 7193	Individual Studies in Preparation for Candidacy Exam			
ENGREDU 7193	Individual Studies in Preparation for Candidacy Exam			
ENGREDU 7193	Individual Studies in Preparation for Candidacy Exam			
ENGREDU 7193	Individual Studies Semester of Candidacy Exam			

Minimum of 4 Candidacy Committee Members (Including Faculty Advisor)	Date of Candidacy Exam
1.	
2.	
3.	
4.	

Candidacy & Residency Requirements

Completed	
	Dissertation completed within 5 years of being admitted to candidacy or one-term extension petition has been approved (via GRADFORMS.OSU.EDU).
	Minimum of 24 graduate credit hours at OSU.

Dissertation Research

Each EED doctoral student must complete a minimum of 6 graduate credit hours research post-candidacy with his/her faculty advisor. It is also a requirement to maintain continuous enrollment (AU/SP, SP/SU, or SU/AU) with 3 graduate credit hours per semester. Summer Term (includes May Session and Summer Session) enrollment is excluded **except** for those completing an exam or defense during the Summer.

Course #	Course Title	Term/Year	Grade	Unit(s)
ENGREDU 8999	Dissertation Research			
ENGREDU 8999	Dissertation Research			
ENGREDU 8999	Dissertation Research			
ENGERDU 8999	Dissertation Research			

Minimum of 3 Dissertation Committee Members (Including Faculty Advisor)	Date of Final Exam
1.	
2.	
3.	
4.	

Student Signature:		Credit Hour Total (Minimum of 80):	
Faculty Advisor Signature:			

Appendix 2e: Examples of Engineering Education
 Doctoral Dissertation Titles from Purdue University
 and Virginia Tech (2006-2015)

Alum	Grad Year	Dissertation Title
Jennifer Mullin	2010	Investigations of Student and Team Creativity on an Introductory Engineering Design Project
Erin Crede	2011	Organization and Retention of Students in Graduate Engineering Research Groups
James Pembridge	2011	Mentoring in Engineering Capstone Design Courses: Beliefs and Practices across Disciplines
Ken Stanton	2011	Engineering Faculty Motivation for and Engagement in Formative Assessment
William Michael Butler	2012	The Impact of Simulation-Based Learning in Aircraft Design on Aerospace Student Preparedness for Engineering Practice: A Mixed Methods Approach
Parhum Delgoshaei	2012	Design and Implementation of a Real-Time Environmental Monitoring Lab with Applications in Sustainability Education
Andrea Goncher	2012	The Identification and Emergence of Constraints in First-Year Design Projects and the Effect on Practice in Engineering Students
Heidi Steinhauer	2012	Assessment of First-Year Engineering Students' Spatial Visualization Skills
Katherine Winters	2012	Career Goals and Actions of Early Career Engineering Graduates
Matthew Boynton	2013	People not Print: Exploring Engineering Future Possible Self Development in Rural Areas of Tennessee's Cumberland Plateau
Cheryl Carrico	2013	Voices in the Mountains: A Qualitative Study Exploring Factors Influencing Appalachian High School Students' Engineering Career Goals
Stephanie Cutler	2013	How Static is the Statics Classroom? An investigation into how innovations, specifically Research-Based Instructional Strategies, are adopted into the Statics classroom
Rachel Louis Kaifez	2013	The Motivation and Identity Development of Graduate Teaching Assistants in First-Year Engineering Programs
M. Jean Mohammadi-Aragh	2013	Characterizing student attention in technology-infused classroom using real-time active window data
Jacob Moore	2013	Promoting Conceptual Understanding via Adaptive Concept Maps
Lauren Thomas	2013	Preparing and Progressing: A Narrative Study of Optics and Photonics Graduate Students' Identity-Trajectory
Rachel McCord	2014	Thinking About Thinking in Study Groups: Studying Engineering Students' Use of Metacognition in Naturalistic Setting
Kevin Sevilla	2014	Virtual Socialization in Engineering Education: Identifying the Impacts of a Socializer-Based Intervention on Second-Year Engineering Students
Hon Jie Teo	2014	Knowledge Creation Analytics for Online Engineering Learning
Kelly Cross	2015	The Experiences of African-American Males on Multiracial Student Teams in Engineering
Deirdre Hunter	2015	Implementing Problem-based Learning in Introductory Engineering Courses: A Qualitative Investigation of Facilitation Strategies
Walter Lee	2015	Providing Co-Curricular Support: A Multi-Case Study of Engineering Student Support Centers
Courtney S. Smith	2015	The Intersecting Perspective: African American Female Experiences with Faculty Mentoring in Undergraduate Engineering
Chris Venters	2015	Using Writing Assignments to Promote Conceptual Knowledge Development in Engineering Statics

Alum	Grad Year	Dissertation Title
Tamara Moore	2006	Student Team Functioning and the Effect on Problem Solving in a First-Year Engineering Course
Stephanie Kusano		Unknown
Mica Green	2007	Factors Affecting the Self-Efficacy Beliefs of First- and Second-Year Engineering Students
Brock Barry	2008	Methods of Incorporating Understanding of Professional and Ethical Responsibility in the Engineering Curriculum and Results from the Fundamentals of Engineering Examination
Shanna Daly	2008	Design Across Disciplines
Holly Matusovich	2008	Choosing Engineering: Can I Succeed and Do I Want To? A Qualitative Study Using Expectancy-Value Theory
Euridice Oware	2008	Examining Elementary Students' Perceptions of Engineers
Alejandra Magana de Leo	2009	Professors' and students' perceptions and experiences of computational simulations as learning tools
Ken Reid	2009	Development of the Student Attitudinal Success Instrument: Assessment of First-Year Engineering Students Including Differences by Gender
Aidsa Santiago Roman	2009	Fitting Diagnostic Assessment to the Concept Assessment Tool for Statics
Odesma Dalrymple	2009	The Pedagogical Value of Disassemble/Analyze/Assemble (DAA) Activities: Assessing the Potential for Transfer
Matthew Verleger	2009	Analysis of an Informed Peer Review Matching Algorithm and Its Impact on Student work on Model-Eliciting Activities
Kerry Meyers	2009	Engineering Identity as a Developmental Process
Tameka Clarke Douglas	2010	A Case Study of an Undergraduate Engineering Peer Tutoring Group: An Investigation of the Structure of a Community of Practice and the Value Members Gain from Participation
Carla Zoltowski	2010	Students' Ways of Experiencing Human-Centered Design
Nathan McNeill	2010	Global Engineering Education Programs: More than Just International Experiences
Greg Bucks	2010	A Phenomenographic Study of the Ways of Understanding Conditional and Repetition Structures in Computer Programming Languages
Yogesh Velankar	2010	Conceptions of research and development work and competence in a high-tech entrepreneurial organization
Irene Mena	2010	Socialization Experiences Resulting from Engineering Teaching Assistantships at Purdue University
Shawn Jordan	2010	Success in Virtual Cross-disciplinary Engineering Design Teams in Industry
Rocio Chavela	2010	Faculty development units at Mexican higher education institutions: A descriptive study of characteristics, common practices and challenges
Katerina Bagiati	2011	Early Engineering: A Developmentally Appropriate Curriculum for Young Children
Michele Strutz	2012	Influences on Low-SES First Generation Students' Decision to Pursue Engineering
Ida Ngambeki	2012	Finding a Place in Engineering: Examining Students' Choice of Engineering Discipline

Alum	Grad Year	Dissertation Title
Lorie Groll	2013	Negotiating Cultural Humility: First-Year Engineering Students' Development in a Lifelong Journey
Qu Jin	2013	Modeling Student Success in Engineering Education
Sensen Li	2013	Formative feedback using pseudo peer diagrams: Evaluating system equilibrium of buoyancy forces
Mary Pilotte	2013	Engineering: Defining and Differentiating Its Unique Culture
Jiabin Zhu	2013	Personal Epistemological Development of Chinese Engineering Doctoral Students in U.S. Institutions: An Application of Perry's Theory
Diana Bairaktarova	2013	Mechanical Objects and the Engineering Learner: An Experimental Study of How the Presence of Objects Affects Students' Performance on Engineering-Related Tasks
Joe Lin	2013	Student success: Approaches to modeling student matriculation and retention
George Ricco	2013	Degree program changes and curricular flexibility: Addressing long held beliefs about student progression
Junqui Wang	2013	Assessment of Engineering Student Team Effectiveness
Beth Holloway	2013	Engineering students at typically invisible transition points: A focus on admissions and the sophomore year
Daniel Ferguson	2013	How engineering innovators characterize engineering innovativeness: A qualitative study
Ruth Wertz	2014	Toward a new model within the community of inquiry framework: Multivariate linear regression analyses based on graduate student perceptions of learning online
Rui Celia Pan	2014	Engineering Students Experiences and Perceptions of Workplace Problem Solving
Junaid Siddiqui	2014	Transformation of engineering education: Taking a perspective for the challenges of change
James Huff	2014	Psychological Journeys of Engineering Identity from School to the Workplace: How Students Become Engineers Among Other Forms of Self
Meagan Pollack	2014	Multiple Case Study Analysis of Young Women's Experiences in High School
Noah Salzman	2014	A Phenomenographic Study of Students' Experiences with Transition from Pre-college Engineering Programs to First-Year Engineering
Anne Lucietto	2014	The Role of Academic Ability in Choice of Major and Persistence in STEM Fields
Velvet Fitzpatrick	2014	Cognitive Diversity in Undergraduate Engineering: Dyslexia
Benjamin Ahn	2014	Creation of an instrument to measure graduate student and postdoctoral mentoring abilities in engineering and science undergraduate research settings
Jeremi London	2014	The impact of National Science Foundation investments in undergraduate engineering education research: An exploratory mixed methods study
Farrah Fayyaz	2014	A Qualitative Study of Problematic Reasonings of Undergraduate Electrical Engineering Students in Continuous Time Signals and Systems Courses
Marisol Mercado Santiago	2014	Culturally Responsive Engineering Education: A Case Study of a Pre-College Introductory Engineering Course at Tibetan Children's Village School of Selaku
Xingyu Chen	2014	The Composition of First-Year Engineering Curricula and Its Relationships to Matriculation Models and Institutional Characteristics
Jacqueline McNeil	2014	Engineering Faculty Views of Teaching Quality, Accreditation, and Institutional Climate and How They Influence Teaching Practices

ENGREDU 6100 (3 Credit) Foundations and the Field of Engineering Education

Time: Day #:## - #:##pm

Classroom: HI ###

Instructor Information

- Instructor: Name
- Office: HI ###
- Email: _____
- Office Hours: By Appointment

Course Description (400 character limit)

This course is designed to prepare students for future courses, and careers in engineering education. Students will engage with literature focusing on theories and frameworks which highlight fundamental issues, questions, and approaches in engineering education.

Course Goals

Following the structure of the OSU EED Graduate Curriculum, this course serves to contribute to student development as seen in Table #. This course does not necessarily seek to fully accomplish any of the listed goals, but contributes to the objectives and outcomes within the goal as shown.

<i>Goals:</i>	<i>Objectives:</i>	<i>Outcomes:</i>
Students will:	Students will:	Students will be able to:
1. Identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs	1A. Engage critical issues in the field with attention to inclusion of multiple perspectives	1.A.(B) Identify several of the contemporary educational issues with attention to inclusion of multiple perspectives and demographics
	1B. Analyze the history and foundations of the education of engineers and the discipline of engineering education in US and international contexts	1.B.(B) Identify broad historical and foundational aspects of engineering education in US and international contexts.
		1.B.(I) Discuss key historical and foundational aspects of engineering education related to contemporary issues in US and international contexts.
	1C. Characterize potential stakeholders and design appropriate engagement strategies	1.C.(B) Identify primary stakeholders of engineering education.
		1.C.(I) Explain relationships among stakeholders and contemporary educational issues.
1D. Identify and interpret stakeholder needs to develop action plans	1.D.(B) Describe several relevant stakeholder needs.	
	1.D.(I) Interpret stakeholder needs in relationship to engineering education.	
2. Design, conduct, and critique research in engineering education	2A. Research with attention to inclusion of multiple perspectives and demographics so that research outcomes are more universally relevant	2.A.(B) Identify ways that diverse populations may be impacted negatively and positively by research.
	2C. Construct appropriate research questions in engineering education that address stakeholder needs and advance the field	2.C.(B) Identify appropriate, researchable questions considering relevant literature that address stakeholder needs and advance the field.
	2F. Communicate results of research efforts in traditional and non-traditional	2.F.(B) Differentiate among and select types of dissemination venues for research.

	forms	
	2G. Critique the quality of engineering education research studies of various types presented in different forms	2.G.(B) Identify quality indicators of research. 2.G.(I) Evaluate the quality of a selected scholarly effort.
	2H. Analyze how a broad array of research projects integrate into the field.	2.H.(B) Recognize prior research conducted in an area of interest.
5. Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits	5B. Demonstrate a mindset that values curiosity and questioning, finds and leverages connections across a wide range of ideas, and creates positive societal value	5.B.(B) Discuss the diverse and rapidly changing world from more than one field of study or perspective with curiosity about potential positive societal values.
	5E. Recognize, analyze, and equitably engage with professional ethical dilemmas	5.E.(B) Recognize complex, multi-layered professional ethical dilemmas.
	5H. Demonstrate empathy and cultural competence across professional interactions	5.H.(B) Identify components of multiple cultural perspectives.
	5J. Value and demonstrate commitment to continuing education and lifelong learning	5.J.(B) Describe multiple continuing education learning experiences explaining the value of lifelong learning.

Table 1: Goals, Objectives, and Outcomes impacted by ENGREDU 6100.

Course Rationale (150 character limit)

This course helps students understand what the field of engineering education is and identify their position within it to guide their proper professional actions.

Course Topics (Learning Objectives)

- Teaching and Learning in engineering education
- Curriculum Development
- Research in Engineering Education
- Change in Engineering Education
- Engineering and Society

Course Materials (Representative Textbook(s)):

Provided by instructor as needed.

Books

- Johri, A., & Olds, B. M. (Eds.). (2014). *Cambridge handbook of engineering education research*. Cambridge University Press.

Week (Date)	Course Topics	Assignment	Class Outcome*
1	Teaching and Learning	Reflections on Readings	1A(B) 1B(B)
2	Teaching and Learning		
3	Curricula Development	Reflections on Readings	1A(B) 1B(B)
4	Curricula Development	Student Presentations	
5	Research in Engineering Education	Student Presentations	1B(I), 2C(B)
6	Research in Engineering Education	Reflections on Readings	2C(B), 2G(B)
7	Change in Engineering Education	Student Presentations	1C(B), 2A(B), 2B(B)
8			
9	Change in Engineering Education	Essay Questions	---
10	Engineering and Society	Reflections on Readings	1C(B), 1D(B), 5E(B)
11	Engineering and Society	Student Presentations	1C(I), 1D(I), 2F(B), 5E(I)
12	Engineering and Society	---	2G(B), 2G(I)
13	What is Engineering Education?	Develop/Write Personal Statements	2C(B), 5B(B), 5B(I), 5J(B)
14			
15	What is Engineering Education?	Peer Critique	2B(B), 5B(I)

* See Table 1

Grades

The course is graded on a standard A-E scale. Course grades will be calculated accordingly:

- **Participation - 20%:** To adequately participate in class, you must complete any required preparation work (readings, videos, etc.) and be engaged throughout each class period.
- **Interest in Engineering Education Statement - 10%:** See handout.
- **Group Presentation/Discussion on Topic of the Day - 20%** (10% each): See handout.
- **Synthesis Essays - 30%** (10% each): See handout.
- **Visualization - 20%:** See handout.

Attendance

Attendance and active participation are required to pass this course and to have an impact on your teaching in a meaningful way. You may have up to two excused absences in this version of the course and still pass the class. If you will be absent, you must notify the instructor as soon as possible. Excused absences include being sick, attending a conference, having a job interview, etc. Unexcused absences are not acceptable.

Students with Disabilities

Any student who feels s/he may need an accommodation based on the impact of a disability should contact the instructor privately to discuss your specific needs. Please contact Student Life Disability Services at 614-292-3307 in room 150 Pomerene Hall to coordinate reasonable accommodations for students with documented disabilities.

Carmen

Carmen is OSU's course management system. Please note that we will be using the Canvas version of Carmen. Carmen uses include:

- Check the "News" items for any course-related or on-campus activities announcements.
- Check your grades from the "Grades" link on the main toolbar in Carmen.
- Access materials for the course from the "Content" link on the main toolbar.
- Access evaluation tools (i.e., surveys, quizzes, etc.) from the "Activities" link on the main toolbar.

Carmen may be accessed at <http://carmen.osu.edu>. For troubleshooting, call 688-HELP or go to <https://resourcecenter.odee.osu.edu/canvas/getting-started-canvas-students>.

Academic Misconduct

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University's Code of Student Conduct, and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University's Code of Student Conduct and this syllabus may constitute academic misconduct.

The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the University,

or subvert the educational process.” Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University’s Code of Student Conduct is never considered an excuse for academic misconduct, so it is recommended that you review the Code of Student Conduct and, specifically, the sections dealing with academic misconduct.

If your instructor suspects that a student has committed academic misconduct in this course, he/she is obligated by University Rules to report suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University’s Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact your instructor.

Ohio State Sexual Harassment Policy

The University administration, faculty, staff, student employees, and volunteers are responsible for assuring that the University maintains an environment for work and study free from sexual harassment. Sexual harassment is unlawful and impedes the realization of the University’s mission of distinction in education, scholarship, and service. Sexual harassment violates the dignity of individuals and will not be tolerated. The University community seeks to eliminate sexual harassment through education and by encouraging faculty, staff, student employees, and volunteers to report concerns or complaints. Prompt corrective measures will be taken to stop sexual harassment whenever it occurs. Source: <http://hr.osu.edu/policy/policy115.pdf>

Student Permission for Program Publicity

During your participation in this course, photographs, printed material, and videotapes may be made for the purpose of informing the university community and the general public about activities in the college. Student images in the above media may be used to promote college programs and to make public announcements of student accomplishments and those of other students. If you do not wish for your image to be used, please let your instructor know.

Information for Distressed Students

A recent American College Health Survey found stress, sleep problems, anxiety, depression, interpersonal concerns, death of a significant other, and alcohol use among the top ten health impediments to academic performance.

Students experiencing personal problems or situational crises during the quarter are encouraged to contact the OSU Counseling and Consultation Service (614-292-5766; www.ccs.osu.edu) for assistance, support and advocacy.

This service is free and confidential.

ENGREDU 6200 (3 Credit) Learning Theory, Pedagogy, and Assessment in Engineering Education

Time: Day #:## - #:##pm

Classroom: HI ###

Instructor Information

- Instructor: Name
- Office: HI ###
- Email: _____
- Office Hours: By Appointment

Course Description (400 character limit)

This course is designed to provide foundational understandings of educational learning theory, pedagogy and assessment methods within engineering education. The processes learned will inform research and instructional practice decisions, approaches and analysis.

Course Goals

Following the structure of the OSU EED Graduate Curriculum, this course serves to contribute to student development as seen in Table #. This course does not necessarily seek to fully accomplish any of the listed goals, but contributes to the objectives and outcomes within the goal as shown.

<i>Goals:</i>	<i>Objectives:</i>	<i>Outcomes:</i>
Students will:	Students will:	Students will be able to:
1. identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs	1A. Engage critical issues in the field with attention to inclusion of multiple perspectives	1.A.(B) Identify several of the contemporary educational issues with attention to inclusion of multiple perspectives and demographics
		1.A.(I) Discuss the main perspectives of contemporary educational issues and describe impact on stakeholders with attention to inclusion of multiple perspectives and demographics.
	1.B. Analyze the history and foundations of the education of engineers and the discipline of engineering education in US and international contexts	1.B.(B) Identify broad historical and foundational aspects of engineering education in US and international contexts.
		1.B.(I) Discuss key historical and foundational aspects of engineering education related to contemporary issues in US and international contexts.
	1.C. Characterize potential stakeholders and design appropriate engagement strategies	1.C.(B) Identify primary stakeholders of engineering education.
		1.C.(I) Explain relationships among stakeholders and contemporary educational issues.
1.D. Identify and interpret stakeholder needs to develop action plans	1.D.(B) Describe several relevant stakeholder needs.	

	2.G. Critique the quality of engineering education research studies of various types presented in different forms	2.G.(B) Identify quality indicators of research. 2.G.(I) Evaluate the quality of a selected scholarly effort.
	2.H. Analyze how a broad array of research projects integrate into the field.	2.H.(I) Determine how to make connections across research themes to identify gaps in literature.
3. demonstrate, value, and apply engineering expertise	3.C. Formulate applications of engineering education to engineering practice and vice versa.	3.C.(B) Discuss a novel solution and translate language to and from engineering and engineering education settings
		3.C.(I) Design and propose a novel solution to and from engineering and engineering education settings
4. create, teach, and assess courses and curricula	4.A. Educate with attention to inclusion of multiple perspectives and demographics so that every student has the opportunity to learn	4.A.(B) Discuss student and teacher similarities and differences across multiple perspectives and demographics
	4.B. Design a course or other significant educational experience founded in learning theory explicitly addressing stakeholder needs	4.B.(I) Critique an existing course syllabus using learning theory.
		4.B.(A) Develop a course syllabus and discuss the choices made founded in learning theory explicitly addressing stakeholder needs.
	4.C. Analyze how multiple courses integrate into a curriculum	4.C.(B) Evaluate a course's significance and effectiveness in the context of other courses in a curriculum.
		4.C.(I) Synthesize a set of courses' impact on students' learning across a curriculum.
		4.C.(A) Propose curricular adjustments to address gaps in achieving learning outcomes.
	4.D. Instruct a course or other significant educational experience using appropriate and evidence-based pedagogical techniques	4.D.(B) Observe a course or other significant educational experience, highlighting the various techniques used and their appropriateness to the context.
	4.E. Assess and improve their own teaching through informed, inquiry-based practice	4.E.(B) Reflect on one's teaching experiences highlighting strengths and areas for improvement
		4.E.(I) Critique different examples of teaching, highlighting the various techniques used and their appropriateness to the context.

	4.F. Develop effective tools to evaluate learning	4.F.(B) Create appropriate learning outcomes.
		4.F.(I) Develop tools that measure learning outcomes at various levels.
	4.H. Design and implement evaluations/assessments of a variety of educational programming	4.H.(B) Describe the differences and similarities between assessment and evaluation.
		4.H.(I) Critique an educational program using appropriate assessment and evaluation tools.
5. Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits	5.B. Demonstrate a mindset that values curiosity and questioning, finds and leverages connections across a wide range of ideas, and creates positive societal value	5.B.(B) Explain the appropriate communication strategies to use with a range of audiences using multiple modes and media.
		5.B.(I) Connect examples, facts, or theories from more than one field of study or perspective and describe how positive societal value is created.
	5.D. Communicate effectively with a range of audiences using multiple modes and media	5.D.(B) Explain the appropriate communication strategies to use with a range of audiences using multiple modes and media.
		5.D.(I) Critique specific communications considering a range of potential audiences.
	5.E. Recognize, analyze, and equitably engage with professional ethical dilemmas	5.E.(B) Recognize complex, multi-layered professional ethical dilemmas.
		5.E.(I) Critique appropriate perspectives and theories used to analyze professional ethical dilemmas, considering full implications.
5.H. Demonstrate empathy and cultural competence across professional interactions	5.H.(B) Identify components of multiple cultural perspectives.	

Table #: Goals, Objectives, and Outcomes impacted by ENGREDU 6200.

Course Rationale (150 character limit)

This course prepares students to contribute to both research and practice in the field of engineering and engineering education by acquiring background in learning theory, pedagogy / andragogy, and assessment / accreditation/ evaluation of learning.

Course Topics (Learning Objectives)

- Pedagogy, Epistemology, and Metacognition
- Learning Theories
- Assessment and Evaluation
- Accreditation and ABET
- Learning Environments in Engineering Education

Course Materials (Representative Textbook(s)):

Provided by instructor as needed.

Week (Date)	Course Topics	Assignment	Class Outcome*
1	Pedagogy, Epistemology, Metacognition	Discussion Worksheet	1A(B), 1B(B), 1C(B)
2	Pedagogical Approaches	Reflections on Readings	1C(I)
3	Course Design	Course Critique	
4	Positivism and Post-Positivism		4A(B), 4F(B), 5D(B), 5H(B)
5	Critical Theory and Constructivism	Rubric Development	4F(I)
6	Learning Theories	Micro-Teaching Session	4A(I), 4D(B), 5D(I)
7	Learning Theories in Engineering	Peer Evaluation	4E(B), 4E(I)
8	Midterm		1A(I), 1B(I), 1D(B)
9	Learning Environments in Engineering	Reflections on Presentation	4B(I), 4D(B)
10	Assessment and Evaluation in Engineering	Course Critique	4H(B), 4H(I), 5B(B), 5B(I), 5E(B), 5E(I)
11	ABET	Reflections on Readings	4B(A)
12	Assessment in Engineering Education	Reflections on Readings	2G(B), 4C(B), 4C(I), 4C(A)
13	Research in Engineering Education	Syllabus Development	2G(I)
14	Work Day	Curricular Critique	3C(B), 3C(I)
15		Micro-Teaching Session	

* See Table 1

Grades

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- Participation - 20%: To adequately participate in class, you must complete any required preparation work (readings, videos, etc.) and be engaged throughout each class period.
- Research Statement - 10%: See handout.
- Group Presentation/Discussion on Topic of the Day - 20%: See handout.
- Synthesis Essays - 30% (10% each): See handout.
- Visualization - 20%: See handout.

Attendance

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Information for Distressed Students

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This service is free and confidential.

ENGREDU 7189.01 (1 Credit)
GTA Preparation and Support
 Time: Thursdays 5:30-6:30pm
 Classroom: HI 244G

Instructor Information

- Instructor: Rachel Kajfez
- Email: Kajfez.2@osu.edu
- Office: HI 244
- Office Hours: By Appointment

Course Description

This course supplements Graduate Teaching Assistant (GTA) content based training by exposing GTAs to instructional pedagogies. It is a practical introduction to engineering education for GTAs. Topics include using assessment for learning, best practices in instructional methods, techniques for self-reflection, etc. This version of the course is designed for new GTAs.

Course Goals

Following the structure of the OSU EED Graduate Curriculum, this course serves to contribute to student development as seen in Table 1. This course does not necessarily seek to fully accomplish any of the listed goals, but contributes to the objectives and outcomes within the goal as shown.

<i>Goals:</i>	<i>Objectives:</i>	<i>Outcomes:</i>
Students will:	Students will:	Students will be able to:
1. Identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs	E. Contribute to high-impact efforts to use and/or transform engineering education to best meet stakeholder needs	(B) Actively participate in an effort that leads to specific application or transformation of engineering education to meet stakeholder needs
3. Demonstrate, value, and apply engineering expertise	C. Formulate applications of engineering education to engineering practice and vice versa	(B) Discuss a novel solution and translate language to and from engineering and engineering education settings
4. Create, teach, and assess courses and curricula	A. Educate with attention to inclusion of multiple perspectives and demographics so that every student has the opportunity to learn	(A) Engage all students in a given educational experience so that every student has the opportunity to learn
	B. Design a course or other significant educational experience founded in learning theory explicitly addressing stakeholder needs	(B) Build a lesson plan addressing stakeholder needs
	C. Analyze how multiple courses integrate into a curriculum	(B) Evaluate a course's significance and effectiveness in the context of other courses in a curriculum
	D. Instruct a course or other significant educational experience	(A) Use appropriate and evidence-based pedagogical techniques while teaching a course

	using appropriate and evidence-based pedagogical techniques	(I) Teach effectively a course or other significant educational experience
	E. Assess and improve their own teaching through informed, inquiry-based practice	(B) Reflect on one's teaching experiences highlighting strengths and areas for improvement (I) Critique different examples of teaching, highlighting the various techniques used and their appropriateness to the context
	F. Develop effective tools to evaluate learning	(I) Develop tools that measure learning outcomes at various levels
	G. Evaluate and improve student learning responsibly, equitably, and in alignment with learning outcomes	(B) Identify students' level of knowledge, skills, and abilities responsibly, equitably, and in alignment with learning outcomes (I) Determine students' difficulties in alignment with various learning outcomes
	H. Design and implement evaluations/assessments of a variety of educational programming	(B) Describe the differences and similarities between assessment and evaluation
5. Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits	A. Engage in professional activities with attention to inclusion of multiple perspectives and demographics in order to create synergy in the midst of differences	(B) Reflect with curiosity about what can be learned from communities and cultures with attention to inclusion of multiple perspectives and demographics in order to create synergy in the midst of differences
	C. Function effectively on diverse, multidisciplinary teams	(I) Participate effectively on a diverse, multidisciplinary team
	F. Demonstrate effective leadership skills	(I) Critique leadership skills of select individuals, considering visioning, conflict and resource management, and mentoring
	H. Demonstrate empathy and cultural competence across professional interactions	(I) Demonstrate empathetic connection to the complexity of elements important to multiple cultures

Table 1: Goals, Objectives, and Outcomes impacted by ENGREDU 7189.01.

Course Rationale

This course helps students develop a deeper relationship between the practices of teaching and learning in engineering education through experiential based activities.

Course Topics

- Teaching Statements
- Teaching Reviews
- Curriculum Development
- Critical Feedback and Reflection
- Assessment and Evaluation

Course Materials:

Provided by instructor as needed.

Course Schedule:

Week (Date)	Course Topics	Assignment	Class Outcome*
1	Course Overview Getting to Know Your Students		
2	Teaching Philosophies and Pedagogy	Teaching Statement	4A(A), 4E(I), 5F(I)
3	Classroom Incivilities		
4	Teaching Reviews	Instructor Evaluation of Teaching	4D(I), 5C(I)
5	Teaching Teaming		
6	Classroom Assessment Techniques	Assessment Development and Implementation	4F(I), 4H(B)
7	Topic of Choice		
8	Diversity and Inclusion	Teaching Feedback and Synthesis	4E(B), 4E(I), 5F(I)
9	Topic of Choice		
10	Crafting an Evaluation	Personalized Peer Teaching Evaluation	4G(I), 4A(a), 4D(I), 4E(I), 5F(I), 4D(A), 5C(I)
11	<i>No Class</i>		
12	Evaluations and Critiques	Course Element Redesign	4C(B), 4B(B), 4G(B), 3C(B), 1E(B)
13	Topic of Choice		
14	The Power of Reflection	Teaching Reflection and Plan for the Future	5A(B), 5H(I)
15	Debriefing Course Evaluation		

* See Table 1

Grades

The course is graded on a standard A-E scale. Course grades will be calculated accordingly:

- **Participation - 20%:** To adequately participate in class, you must complete any required preparation work (readings, videos, etc.) and be engaged throughout each class period.
- **Teaching Statement - 10%:** See handout.
- **Assessment Development and Implementation - 10% (10% each):** See handout.
- **Teaching Feedback and Synthesis - 10% (10% each):** See handout.
- **Personalize Peer Teaching Evaluation - 20%:** See handout.
- **Course Element Redesign – 15%:** See handout.
- **Teaching Reflection and Plan for the Future – 15%:** See handout.

Attendance

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Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University.

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Information for Distressed Students

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This service is free and confidential.

**ENGREDU 7189.02 (1 Credit)
GTA Professional Development**

Time: Wednesdays 5:30-6:30pm

Classroom: HI 244G

Instructor Information

- Instructor: Rachel Kajfez
- Email: Kajfez.2@osu.edu
- Office: HI 244
- Office Hours: By Appointment

Course Description

This course supplements Graduate Teaching Assistant (GTA) content based training by exposing GTAs to instructional pedagogies. It is a practical extension of ENGREDU 7189.01. Topics include developing new teaching modules, creating training materials for fellow GTAs, furthering techniques for reflection, etc. This version of the course is designed for experienced GTAs.

Course Goals

Following the structure of the OSU EED Graduate Curriculum, this course serves to contribute to student development as seen in Table 1. This course does not necessarily seek to fully accomplish any of the listed goals, but contributes to the objectives and outcomes within the goal as shown.

<i>Goals:</i>	<i>Objectives:</i>	<i>Outcomes:</i>
Students will:	Students will:	Students will be able to:
1. Identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs	E. Contribute to high-impact efforts to use and/or transform engineering education to best meet stakeholder needs	(B) Actively participate in an effort that leads to specific application or transformation of engineering education to meet stakeholder needs
3. Demonstrate, value, and apply engineering expertise	C. Formulate applications of engineering education to engineering practice and vice versa	(I) Design and propose a novel solution to and from engineering and engineering education settings
4. Create, teach, and assess courses and curricula	A. Educate with attention to inclusion of multiple perspectives and demographics so that every student has the opportunity to learn	(A) Engage all students in a given educational experience so that every student has the opportunity to learn
	B. Design a course or other significant educational experience founded in learning theory explicitly addressing stakeholder needs	(I) Critique an existing course syllabus using learning theory
	C. Analyze how multiple courses integrate into a curriculum	(A) Propose curricular adjustments to address gaps in achieving learning outcomes
	D. Instruct a course or other significant educational experience using appropriate and evidence-based pedagogical techniques	(A) Use appropriate and evidence-based pedagogical techniques while teaching a course

	E. Assess and improve their own teaching through informed, inquiry-based practice	(A) Gather and apply teaching feedback
	F. Develop effective tools to evaluate learning	(A) Revise tools and learning outcomes based on experiences and student feedback
	G. Evaluate and improve student learning responsibly, equitably, and in alignment with learning outcomes	(I) Determine students' difficulties in alignment with various learning outcomes
		(A) Develop responsible and equitable strategies to assist students in their learning that align with learning outcomes
	H. Design and implement evaluations/assessments of a variety of educational programming	(I) Critique an educational program using appropriate assessment and evaluation tools
		(A) Develop a tool to assess and evaluate the effectiveness of an educational program
5. Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits	A. Engage in professional activities with attention to inclusion of multiple perspectives and demographics in order to create synergy in the midst of differences	(B) Reflect with curiosity about what can be learned from communities and cultures with attention to inclusion of multiple perspectives and demographics in order to create synergy in the midst of differences
		(I) Demonstrate evidence of adjustment in attitudes and beliefs through working within and learning from diverse communities and cultures
	C. Function effectively on diverse, multidisciplinary teams	(I) Participate effectively on a diverse, multidisciplinary team
	F. Demonstrate effective leadership skills	(I) Critique leadership skills of select individuals, considering visioning, conflict and resource management, and mentoring
	H. Demonstrate empathy and cultural competence across professional interactions	(I) Demonstrate empathetic connection to the complexity of elements important to multiple cultures

Table 1: Goals, Objectives, and Outcomes impacted by ENGREDU 7189.02.

Course Rationale

This course helps students further explore the relationship between practices of teaching and learning in engineering through experiential based activities.

Course Topics

- Teaching Philosophies
- Teaching Reviews
- Curriculum Development
- Critical Feedback and Reflection
- Assessment and Evaluation

Course Materials:

Provided by instructor as needed.

Course Schedule:

Week (Date)	Course Topics	Assignment	Class Outcome*
1	Course Overview Understanding Your Teaching Perspective	Teaching Philosophy	5A(B)
2	GTA Development Theories	Professional Development Teaching Plan	1E(B)
3	Individual Meetings		
4	Student Evaluations and Reflecting on Feedback	Student Evaluation Tool	4H(A), 4H(A), 4A(A), 4D(A)
5	<i>No Class</i>		
6	Individual Meetings	Critique Syllabus and Course	3C(I), 4C(A), 4B(I), 4H(I)
7	Topic of Choice		
8	Translating Teaching Experience to Other Contexts	Teaching Feedback and Synthesis	4E(A)
9	Topic of Choice		
10	Individual Meetings		
11	<i>No Class</i>	Student Evaluation Tool Revision	4F(A), 4H(A), 4E(A), 4G(I)
12	Topic of Choice		
13	Topic of Choice		
14	Individual Meetings	Teaching Philosophy Revision and Critique Your Own Teaching	5A(I), 5H(I), 5F(I), 4G(A), 5C(I)
15	Debriefing Course Evaluation		

* See Table 1

Grades

The course is graded on a standard A-E scale. Course grades will be calculated accordingly:

- **Participation – 20%:** To adequately participate in class, you must complete any required preparation work (readings, videos, etc.) and be engaged throughout each class period.
- **Teaching Philosophy and Revision/Critique – 20%:** See handout.
- **Professional Development Teaching Plan – 20%:** See handout.
- **Student Evaluation Tool and Revision – 20%:** See handout.
- **Peer Review of Teaching – 10%:** See handout.
- **Teaching Feedback and Synthesis – 10%:** See handout.

Attendance

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ENGREDU 7780 (3 Credit) Engineering Education Research Methods

Time: Day ### - #:##pm

Classroom: HI ###

Instructor Information

- Instructor: Name
- Office: HI ###
- Email: _____
- Office Hours: By Appointment

Course Description (400 character limit)

This course is designed to prepare students for productive research in engineering education throughout their graduate experience and professional careers. Research methods are highlighted and explored including quantitative, qualitative, and mixed methods.

Course Goals

Following the structure of the OSU EED Graduate Curriculum, this course serves to contribute to student development as seen in Table #. This course does not necessarily seek to fully accomplish any of the listed goals, but contributes to the objectives and outcomes within the goal as shown.

<i>Goals:</i>	<i>Objectives:</i>	<i>Outcomes:</i>
Students will:	Students will:	Students will be able to:
1. identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs	1A. Engage critical issues in the field with attention to inclusion of multiple perspectives	1.A.(B) Identify several of the contemporary educational issues with attention to inclusion of multiple perspectives and demographics
		1.A.(I) Discuss the main perspectives of contemporary educational issues and describe impact on stakeholders with attention to inclusion of multiple perspectives and demographics.
	1.E. Contribute to high-impact efforts to use and/or transform engineering education to best meet stakeholder needs	1.E.(B) Actively participate in an effort that leads to specific application or transformation of engineering education to meet stakeholder needs.
2. design, conduct, and critique research in engineering education	2A. Research with attention to inclusion of multiple perspectives and demographics so that research outcomes are more universally relevant	2.A.(B) Identify ways that diverse populations may be impacted negatively and positively by research.
		2.A.(I) Reflect critically on research across various fields that targets diverse audiences.
	2.B. Demonstrate awareness of broadly applicable research opportunities, funding, resources, and communications (internal and external to the field)	2.B.(B) Identify current research opportunities and communications within and outside of engineering education.

	2C. Construct appropriate research questions in engineering education that address stakeholder needs and advance the field	2.C.(B) Identify appropriate, researchable questions considering relevant literature that address stakeholder needs and advance the field.
		2.C.(I) Appraise whether research questions appropriately align with an overall research study design, address stakeholder needs, and advance the field and contributes to larger body of knowledge in engineering education.
		2.C.(A) Develop sound engineering education research questions that address stakeholder needs and advance the field.
	2.D. Design research that uses appropriate and evidence-based methods	2.D.(B) Define qualitative, quantitative, and mixed methods commonly used within and outside of engineering education research.
		2.D.(I) Select appropriate methods to research questions.
	2.E. Collect, analyze, and interpret data using appropriate techniques	2.E.(B) Collect, analyze, and interpret data within a given set of research parameters
	2F. Communicate results of research efforts in traditional and non-traditional forms	2.F.(B) Differentiate among and select types of dissemination venues for research.
	2G. Critique the quality of engineering education research studies of various types presented in different forms	2.G.(B) Identify quality indicators of research.
		2.G.(I) Evaluate the quality of a selected scholarly effort.
	2H. Analyze how a broad array of research projects integrate into the field.	2.H.(B) Recognize prior research conducted in an area of interest.
2.I. Structure, manage, and implement research projects.	2.I.(B) Define the aspects of research project management.	
	2.I.(I) Develop a structured plan to manage a research study for implementation.	
5. identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits	5.C. Function effectively on diverse, multidisciplinary teams	5.C.(B) Discuss the elements of effective teamwork and importance of diverse, multidisciplinary teams.
	5.D. Communicate effectively with a range of audiences using multiple modes and media	5.D.(B) Explain the appropriate communication strategies to use with a range of audiences using multiple modes and media.
		5.D.(I) Critique specific communications considering a range of potential audiences.
5.E. Recognize, analyze, and equitably engage with professional ethical dilemmas	5.E.(B) Recognize complex, multi-layered professional ethical dilemmas.	

	5.G. Apply appropriate principles to manage teams and projects	5.G.(B) Describe the project management process and primary constraints including scope, schedule, budget, and quality.
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Table #: Goals, Objectives, and Outcomes impacted by ENGREDU 6100.

Course Rationale (150 character limit)

This course prepares students to perform research by using research methods appropriate to the field of engineering education..

Course Topics (Learning Objectives)

- Teaching and Learning in engineering education
- Curriculum Development
- Research in Engineering Education
- Change in Engineering Education
- Engineering and Society

Course Materials (Representative Textbook(s)):

Provided by instructor as needed.

Week (Date)	Course Topics	Assignment	Class Outcome*
1	What are you curious about? Research Process		
2	What is a research question? (scope, focus, etc.); Frameworks and Lens (theory)	Research Statement	4A(A), 4E(I), 5F(I)
3	Methods		
4	Presentation Skills; Methods	Methods Presentation	4D(I), 5C(I)
5	Methods		
6	Lit Reviews; How to find and manage and read papers; Information Literacy Management	Assessment Development and Implementation	4F(I), 4H(B)

7	IRB; Collecting Data	Mini-Lit Review	
8	Finding; Proposals	Teaching Feedback and Synthesis	4E(B), 4E(I), 5F(I)
9	Validity and Reliability		
10	Analysis Resources; Data Management	Personalized Peer Teaching Evaluation	4G(I), 4A(a), 4D(I), 4E(I), 5F(I), 4D(A), 5C(I)
11	<i>Effective Meetings</i>		
12	Optimizing Expert's Time	Course Element Redesign	4C(B), 4B(B), 4G(B), 3C(B), 1E(B)
13	Presentation skills; Presenting your work (posters and various papers); Draft poster/ practice session		
14	Poster session; Research wrap up	Teaching Reflection and Plan for the Future	5A(B), 5H(I)
15			

* See Table 1

Grades

The course is graded on a standard A-E scale. Course grades will be calculated accordingly:

- Participation - 20%: To adequately participate in class, you must complete any required preparation work (readings, videos, etc.) and be engaged throughout each class period.
- Interest in Engineering Education Statement - 10%: See handout.
- Group Presentation/Discussion on Topic of the Day - 20%: See handout.
- Synthesis Essays - 30% (10% each): See handout.
- Visualization - 20%: See handout.

Attendance

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the course and still pass the class. If you will be absent, you must notify the instructor as soon as possible. Excused absences include being sick, attending a conference, having a job interview, etc. Unexcused absences are not acceptable.

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ENGREDU 7881 (3 Credit) Engineering Education Seminar

Time: Day #:## - #:## pm

Classroom: HI ###

Instructor Information

- Instructor: Name
- Office: HI ###
- Email: _____
- Office Hours: By Appointment

Course Description (400 character limit)

This course is designed to provide students with the ability to maintain contemporary knowledge of the field of engineering education, understand how to communicate within the field, provide exposure to different stakeholders, and build community among engineering educators.

Course Goals

Following the structure of the OSU EED Graduate Curriculum, this course serves to contribute to student development as seen in Table #. This course does not necessarily seek to fully accomplish any of the listed goals, but contributes to the objectives and outcomes within the goal as shown.

<i>Goals:</i>	<i>Objectives:</i>	<i>Outcomes:</i>
Students will:	Students will:	Students will be able to:
1. Identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs	1A. Engage critical issues in the field with attention to inclusion of multiple perspectives	1.A.(I) Discuss the main perspectives of contemporary educational issues and describe impact on stakeholders with attention to inclusion of multiple perspectives and demographics.
	1.B. Analyze the history and foundations of the education of engineers and the discipline of engineering education in US and international contexts	1.B.(I) Discuss key historical and foundational aspects of engineering education related to contemporary issues in US and international contexts.
	1.C. Characterize potential stakeholders and design appropriate engagement strategies	(I) Explain relationships among stakeholders and contemporary educational issues.
	1.D. Identify and interpret stakeholder needs to develop action plans	(I) Interpret stakeholder needs in relationship to engineering education.
2. Design, conduct, and critique research in engineering education	2A. Research with attention to inclusion of multiple perspectives and demographics so that research outcomes are more universally relevant	2.A.(I) Reflect critically on research across various fields that targets diverse audiences.
	2.B. Demonstrate awareness of broadly applicable research opportunities, funding, resources, and communications (internal and	2.B.(B) Identify current research opportunities and communications within and outside of engineering education.

	external to the field)	
	2.C. Construct appropriate research questions in engineering education that address stakeholder needs and advance the field	2.C.(I) Appraise whether research questions appropriately align with an overall research study design, address stakeholder needs, and advance the field and contributes to larger body of knowledge in engineering education.
	2.G. Critique the quality of engineering education research studies of various types presented in different forms	2.G.(I) Evaluate the quality of a selected scholarly effort.
	2.H. Analyze how a broad array of research projects integrate into the field.	2.H.(I) Determine how to make connections across research themes to identify gaps in literature.
5. Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits	5.A. Engage in professional activities with attention to inclusion of multiple perspectives and demographics in order to create synergy in the midst of differences.	5.A.(I) Discuss the elements of effective teamwork and importance of diverse, multidisciplinary teams.
	5.B. Demonstrate a mindset that values curiosity and questioning, finds and leverages connections across a wide range of ideas, and creates positive societal value	5.B.(B) Explain the appropriate communication strategies to use with a range of audiences using multiple modes and media.
	5.D. Communicate effectively with a range of audiences using multiple modes and media	(B) Explain the appropriate communication strategies to use with a range of audiences using multiple modes and media.
		5.D.(I) Critique specific communications considering a range of potential audiences.
		(A) Disseminate/publish appropriate to target audience(s) using multiple modes and media.
		5.E.(B) Recognize complex, multi-layered professional ethical dilemmas.
	5.E. Recognize, analyze, and equitably engage with professional ethical dilemmas	
	5.I. Prepare professional documents and demonstrate effective communication skills appropriate to a variety of job search and career advancement processes	5.I.(B) Describe documents prepared regularly in professional career contexts and identify quality indicators of each.
5.J. Value and demonstrate commitment to continuing education and lifelong learning	5.J.(B) Describe multiple continuing education learning experiences explaining the value of lifelong learning.	

Table #: Goals, Objectives, and Outcomes impacted by ENGREDU 6100.

Course Rationale (150 character limit)

This course prepares students to be conversant with contemporary issues and topics within the field of engineering education and associated disciplines.

Course Topics (Learning Objectives)

- Contemporary issues and dialogs of Engineering Education
- Journal Review and Discussion
- Communication within Engineering Education
- Professional Development
- Research in Engineering Education
- Research outside of Engineering Education and its relation to our field

Course Materials (Representative Textbook(s)):

Provided by instructor as needed.

Week (Date)	Course Topics	Assignment	Class Outcome*
1	Introduction to Seminar/Setting the Stage	Reflections on Readings	
2	Research Presentation in Engineering Education (EED Member)		2B (B)
3	Teaching Presentation	Reflections on Readings	1A (I)
4	Teaching-Related Discussion		1A (I)
5	Research Presentation - Non Engineering Education	Reflections on Readings	2A (I), 2B (B)
6			
7	Journal Article Discussion	On-line Essays	
8	Professional Development Presentation		5J (B), 5I(B)
9	Panel Discussion	Reflections on Presentation	2B (I), 2D (I), 5E (A)
10	Professional Development Mini-Workshop		5A (I), 5D (B)
11	Research Presentation in Engineering Education (Non EED Member)		2A (I), 2B (B)

12	Student Facilitated Discussion	Reflections on Presentation	1C (I), 1D (I), 5A (I)
13	Student Team Presentations		1C (I), 1D (I), 5A (I), 5B (A)
14		Reflections on Presentation	1C (I), 1D (I), 5A (I), 5B (A)
15			5B (A), 5D (I), 5D (A)

* See Table 1

Grades

The course is graded on a standard A-E scale. Course grades will be calculated accordingly:

- **Participation - 40%:** To adequately participate in class, you must complete any required preparation work (readings, videos, etc.) and be engaged throughout each class period.
- **Reflections on Engineering Education Statement - 30%:** See handout.
- **Group Presentation/Discussion on Topic of the Day - 20%** (10% each): See handout.
- **Synthesis Essays - 10%:** See handout.

Attendance

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ENGREDU 7900 (3 Credit) Career Exploration and Professional Development

Time: Day #:## - #:##pm

Classroom: HI ###

Instructor Information

- Instructor: Name
- Office: HI ###
- Email: _____
- Office Hours: By Appointment

Course Description (400 character limit)

This course is designed to prepare students for future careers and professional advancement at universities, colleges, community colleges, and technical colleges (both in tenure-track and clinical faculty appointments), government agencies, private industry, corporate training organizations, non-profits, and high schools challenged with incorporating engineering design into core science standards.

Course Goals

Following the structure of the OSU EED Graduate Curriculum, this course serves to contribute to student development as seen in Table #1. This course does not necessarily seek to fully accomplish any of the listed goals, but contributes to the objectives and outcomes within the goal as shown.

<i>Goals:</i>	<i>Objectives:</i>	<i>Outcomes:</i>
Students will:	Students will:	Students will be able to:
1. Identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs	1A. Engage critical issues in the field with attention to inclusion of multiple perspectives	1.A.(I) Discuss the main perspectives of contemporary educational issues and describe impact on stakeholders with attention to inclusion of multiple perspectives and demographics.
	1.B. Analyze the history and foundations of the education of engineers and the discipline of engineering education in US and international contexts	1.B.(I) Discuss key historical and foundational aspects of engineering education related to contemporary issues in US and international contexts.
		1.B.(A) Synthesize relevant educational history and foundations of critical contemporary issues in US and international contexts.
	1.C. Characterize potential stakeholders and design appropriate engagement strategies	1.C.(B) Identify primary stakeholders of engineering education.
		1.C.(I) Explain relationships among stakeholders and contemporary educational issues.
		1.C.(A) Define appropriate engagement strategies with stakeholders.
	1.D. Identify and interpret stakeholder needs to develop	1.D.(B) Describe several relevant stakeholder needs.

	action plans	1.D.(I) Interpret stakeholder needs in relationship to engineering education.
		1.D.(A) Create an action plan to address one or more stakeholder needs.
2. Design, conduct, and critique research in engineering education	2.B. Demonstrate awareness of broadly applicable research opportunities, funding, resources, and communications (internal and external to the field)	2.B.(I) Distinguish between types of resources and funding available and the corresponding reporting expectations.
		2.B.(A) Select appropriate research opportunities, funding, resources, and communications that aligns with one's research interests and expertise.
	2.F. Communicate results of research efforts in traditional and non-traditional forms	2.F.(B) Differentiate among and select types of dissemination venues for research.
	2.H. Analyze how a broad array of research projects integrate into the field.	2.H.(A) Propose a research agenda informed from a synthesis of existing literature and research across multiple fields.
3. Demonstrate, value, and apply engineering expertise	3.D. Identify pathways for lifelong learning in engineering	3.D.(I) Propose a professional development agenda illustrating pathways for lifelong learning in engineering.
		3.D.(A) Demonstrate engagement within opportunities for lifelong learning in engineering.
5. Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits	5.A. Engage in professional activities with attention to inclusion of multiple perspectives and demographics in order to create synergy in the midst of differences.	5.A.(B) Reflect with curiosity about what can be learned from communities and cultures with attention to inclusion of multiple perspectives and demographics in order to create synergy in the midst of differences.
	5.C. Function effectively on diverse, multidisciplinary teams	5.C.(B) Discuss the elements of effective teamwork and importance of diverse, multidisciplinary teams.
	5.D. Communicate effectively with a range of audiences using multiple modes and media	5.D.(I) Critique specific communications considering a range of potential audiences.
		5.D.(A) Disseminate/publish appropriate to target audience(s) using multiple modes and media.
	5.F. Demonstrate effective leadership skills	5.F.(B) Discuss the elements of effective leadership skills, including self-awareness, resource management, and motivating others.
		5.F.(I) Critique leadership skills of select individuals, considering visioning, conflict and resource management, and mentoring.

	5.G. Apply appropriate principles to manage teams and projects	5.G.(B) Describe the project management process and primary constraints including scope, schedule, budget, and quality.
		5.G.(I) Critique project management from a variety of sectors including education, development, and industry.
	5.H. Demonstrate empathy and cultural competence across professional interactions	5.H.(A) Promote empathy and cultural competence across professional interactions.
	5.I. Prepare professional documents and demonstrate effective communication skills appropriate to a variety of job search and career advancement processes	5.I.(B) Describe documents prepared regularly in professional career contexts and identify quality indicators of each.
		5.I.(I) Prepare documents and demonstrate effective communication skills appropriate to a variety of job search and career advancement processes .
		5.I.(A) Solicit feedback from multiple sources and revise professional documents appropriate to career goals.
	5.J. Value and demonstrate commitment to continuing education and lifelong learning	5.J.(B) Describe multiple continuing education learning experiences explaining the value of lifelong learning.
		5.J.(I) Develop and pursue plans for lifelong learning to support career goals.

Table 1: Goals, Objectives, and Outcomes impacted by ENGREDU 7900.

Course Rationale (150 character limit)

This course helps students prepare for successfully engaging in engineering education careers across a variety of institutions and organizations.

Course Topics (Learning Objectives)

- EED Stakeholders
- Career Options and Job Search Dynamics
- Teamwork
- Project Management
- Empathy
- Professional Development

Course Materials (Representative Textbook(s)):

Provided by instructor as needed.

Week (Date)	Course Topics	Assignment	Class Outcome*
1	Critical Issues in Engineering Education		
2	Inclusion of Multiple Perspectives Social Skills/Relationship Building	Reflections on Readings	1A(I), 1B(I), 1B(A), 5A(B)
3	EED Stakeholders Leveraging Your Network	Stakeholder Analysis Memo	1C(B), 1C(I), 1C(A), 1D(B), 1D(I), 1D(A)
4	Faculty Careers and Options	LinkedIn Profile Cover Letter	2B(I), 2B(A)
5	Academic Job Search	Academic CV and Statements of Research/Teaching	2F(B), 2H(A), 5D(B), 5I(B)
6	Industry Careers and Options	ABET, TUEE Analysis Memo	3D(I)
7	Industry Job Search	Industry Resume	3D(A), 5D(I), 5I(B)
8	Government and Non-Commercial Careers and Options	Government Application	5D(A),5C(B)
9	Teamwork	Professional Portfolio	5C(B), 5F(B), 5F(I)
10	Project Management	Job Postings and Search Analysis	5G(B), 5G(I)
11	Empathy in Engineering Education	Career Plan	5H(A)
12	Professional Documents for Job Search	CV / Resume / Application	5I(I), 5I(A)
13	Professional Development Options	Career Plan	5J(B)
14	Entrepreneurial and Intrapreneurial Options	Professional e-Portfolio	5J(I)
15			

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* See Table 1

Grades

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- **Participation - 20%:** To adequately participate in class, you must complete any required preparation work (readings, videos, etc.) and be engaged throughout each class period.
- **Interest in Engineering Education Statement - 10%:** See handout.
- **Group Presentation/Discussion on Topic of the Day - 20%** (10% each): See handout.
- **Synthesis Essays - 30%** (10% each): See handout.
- **Visualization - 20%:** See handout.

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Assessment: Assessment Unit Planning



Proposed PhD in Engineering Education

Program - Engineering Education (PH)

Outcome: Inclusive engagement with critical issues

1. A. Engage critical issues in the field with attention to inclusion of multiple perspectives and demographics

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Critical Thinking

Outcome Category (Other): Diversity

Assessment Methods

Direct - Other classroom assessment methods - ENGR 6200 - Learning theory, pedagogy and assessment course - discussion worksheet on Pedagogy, Epistemology, and Metacognition as well as midterm exam (Inactive)

Direct - Other classroom assessment methods - ENGR 6200 - Learning theory, pedagogy and assessment course - discussion worksheet on Pedagogy, Epistemology, and Metacognition as well as midterm exam (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs

Outcome: History and Foundations

1.B. Analyze the history and foundations of the education of engineers and the discipline of engineering education in the US and international contexts

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Global Perspectives/Issues

Outcome Category (Other): Historical Perspective

Assessment Methods

Direct - Writing assignment - ENGR 6100 - Foundations and the Field of Engineering Education – written reflections on reading (Active)

Related Goals

Program - Engineering Education (PH)

Program - Engineering Education (PH)

Skill-Cognitive - Identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs

Outcome: Characterize Potential Stakeholders

1.C. Characterize potential stakeholders and design appropriate engagement strategies

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Communication-Oral

Outcome Category (Other): Interaction with Selected Audiences

Assessment Methods

Direct - Writing assignment - ENGR 6200 - Learning theory, pedagogy and assessment course – course midterm exam (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs

Outcome: Identify and Interpret Stakeholder Needs

1. D. Identify and interpret stakeholder needs to develop action plans

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Cultural Awareness

Outcome Category (Other): Interaction with Selected Audiences

Assessment Methods

Direct - Writing assignment - ENGR 6100 - Foundations and the Field of Engineering Education – written reflections on reading (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs

Outcome: Contribute to high impact efforts

1. E. Contribute to high impact efforts to use and/or transform engineering education to best meet stakeholder needs

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Problem Solving

Outcome Category (Other): Integration and Synthesis

Assessment Methods

Direct - Graduate - Dissertation - Oral presentation/defense - engineering education dissertation defense (Active)

Program - Engineering Education (PH)

Program - Engineering Education (PH)

Skill-Cognitive - Identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs

Outcome: Research with attention to inclusion and diversity

2. A. Research with attention to inclusion of multiple perspectives and demographics so that research outcomes are more universally relevant

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Diversity

Outcome Category (Other): Methods / Modes of Inquiry

Assessment Methods

Direct - Student Research - engineering education dissertation research (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Design, conduct, and critique research in engineering education

Outcome: Demonstrate awareness of broadly applicable research

2. B. Demonstrate awareness of broadly applicable research opportunities, funding, resources, and communications (internal and external to the field)

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Information Literacy

Outcome Category (Other): Knowledge-Specialized

Assessment Methods

Direct - Writing assignment - ENGR 7900 - Professional Development in Engineering Education – career plan and statement writing assignment (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Design, conduct, and critique research in engineering education

Outcome: Construct Appropriate Research Questions

2. C. Construct appropriate research questions in engineering education that address stakeholder needs and advance the field

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Methods / Modes of Inquiry

Assessment Methods

Direct - Graduate - Dissertation - Written document - engineering education dissertation written document (Active)

Related Goals

Program - Engineering Education (PH)

Program - Engineering Education (PH)

Skill-Cognitive - Design, conduct, and critique research in engineering education

Outcome: Design research

2. D. Design research that uses appropriate and evidence-based methods

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Methods / Modes of Inquiry

Assessment Methods

Direct - Other classroom assessment methods - ENGR 7780 - Research Methods in Engineering Education – course term project (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Design, conduct, and critique research in engineering education

Outcome: Collect, Analyze, and Interpret Data

2. E. Collect, analyze, and interpret data using appropriate techniques

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Analytical Reasoning/Qualitative

Outcome Category (Other): Analytical Reasoning/Quantitative

Assessment Methods

Direct - Graduate - Dissertation - Oral presentation/defense - engineering education dissertation defense (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Design, conduct, and critique research in engineering education

Outcome: Communicate Research Results

2. F. Communicate results of research efforts in traditional and non-traditional forms

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Communication-Oral

Outcome Category (Other): Communication-Visual, Communication-Written

Assessment Methods

Direct - Publications - engineering education dissertation research (Active)

Related Goals

Program - Engineering Education (PH)

Program - Engineering Education (PH)

Skill-Cognitive - Design, conduct, and critique research in engineering education

Outcome: Critique the Quality of Engineering Education Research

2. G. Critique the quality of engineering education research studies of various types presented in different forms

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Analytical Reasoning/Qualitative

Outcome Category (Other): Analytical Reasoning/Quantitative, Critical Thinking

Assessment Methods

Direct - Other classroom assessment methods - ENGR 7881 - Engineering Education Seminar – discussion, interaction, and reflection with multiple stakeholders and audiences within seminar series (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Design, conduct, and critique research in engineering education

Outcome: Analyze How Research Integrates into Field

2. H. Analyze how a broad array of research projects integrate into the field

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Integration and Synthesis

Assessment Methods

Direct - Other classroom assessment methods - ENGR 7881 - Engineering Education Seminar – discussion, interaction, and reflection with multiple stakeholders and audiences within seminar series (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Design, conduct, and critique research in engineering education

Outcome: Manage Research Projects

2. I. Structure, manage, and implement research projects

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Clinical Skills/Experience

Outcome Category (Other): Generalization and Application

Assessment Methods

Direct - Graduate - Thesis/Comprehensive Examination - Written document - engineering education dissertation written document (Active)

Program - Engineering Education (PH)

Program - Engineering Education (PH)

Skill-Cognitive - Design, conduct, and critique research in engineering education

Outcome: Apply Engineering Mindset to Solve Problems

3. A. Apply an engineering mindset to devise solutions to complex problems with attention to inclusion of multiple perspectives and demographics

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Problem Solving

Assessment Methods

Direct - Portfolio - Engineering portfolio ± MEng or equivalent (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Demonstrate, value, and apply engineering expertise

Outcome: Demonstrate Engineering Competence

3. B. Demonstrate engineering competence in at least one specific domain.

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Knowledge-Specialized

Outcome Category (Other): Professionalism (default for specialized skills and practices, e.g., patient care)

Assessment Methods

Direct - Portfolio - Engineering portfolio ± MEng or equivalent (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Demonstrate, value, and apply engineering expertise

Outcome: Formulate Applications to Engineering Practice

3. C. Formulate applications of engineering education to engineering practice and vice versa

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Generalization and Application

Assessment Methods

Direct - Practicum/fieldwork - ENGR 7189.01 - GTA Preparation and Support – teaching practicum (Active)

Related Goals

Program - Engineering Education (PH)

Program - Engineering Education (PH)

Skill-Cognitive - Demonstrate, value, and apply engineering expertise

Outcome: Identify Pathways to Lifelong Learning

3. D. Identify pathways for lifelong learning in engineering

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Continuous Learning and Adaptability

Assessment Methods

Direct - Other culminating project - ENGR 7900 - Professional Development in Engineering Education – professional e-portfolio (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Demonstrate, value, and apply engineering expertise

Outcome: Educate with Attention to Inclusion

4. A. Educate with attention to inclusion of multiple perspectives and demographics so that every student has the opportunity to learn

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Communication-Instructional

Outcome Category (Other): Cultural Awareness, Diversity

Assessment Methods

Direct - Writing assignment - ENGR 6200 - Learning theory, pedagogy and assessment course – written reflections on reading (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Create, teach, and assess courses and curricula

Outcome: Design a Course Founded in Learning Theory

4. B. Design a course or other significant educational experience founded in learning theory explicitly addressing stakeholder needs

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Communication-Instructional

Outcome Category (Other): Knowledge-Specialized

Assessment Methods

Direct - Practicum/fieldwork - ENGR 7189.02 - GTA Professional Development – teaching practicum (Active)

Program - Engineering Education (PH)

Program - Engineering Education (PH)

Skill-Cognitive - Create, teach, and assess courses and curricula

Outcome: Analyze Courses and Curriculum

4. C. Analyze how multiple courses integrate into a curriculum

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Communication-Instructional

Outcome Category (Other): Integration and Synthesis

Assessment Methods

Direct - Writing assignment - ENGR 6200 - Learning theory, pedagogy and assessment course – written reflections on reading (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Create, teach, and assess courses and curricula

Outcome: Instruct a Course

4. D. Instruct a course or other significant educational experience using appropriate and evidence-based pedagogical techniques

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Clinical Skills/Experience

Outcome Category (Other): Communication-Instructional

Assessment Methods

Direct - Practicum/fieldwork - ENGR 7189.01 - GTA Preparation and Support – teaching practicum (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Create, teach, and assess courses and curricula

Outcome: Assess and Improve Own Teaching

4. E. Assess and improve their own teaching through informed, inquiry-based practice

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Continuous Learning and Adaptability

Assessment Methods

Direct - Practicum/fieldwork - ENGR 7189.01 - GTA Preparation and Support – teaching practicum (Active)

Related Goals

Program - Engineering Education (PH)

Program - Engineering Education (PH)

Skill-Cognitive - Create, teach, and assess courses and curricula

Outcome: Develop Evaluation Tools

4. F. Develop effective tools to evaluate learning

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Integration and Synthesis

Assessment Methods

Direct - Use of Rubrics - ENGR 6200 - Learning theory, pedagogy and assessment course – rubric development (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Create, teach, and assess courses and curricula

Outcome: Evaluate and Improve Student Learning

4. G. Evaluate and improve student learning responsibly, equitably, and in alignment with learning outcomes

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Analytical Reasoning/Qualitative

Outcome Category (Other): Analytical Reasoning/Quantitative, Continuous Learning and Adaptability

Assessment Methods

Direct - Other classroom assessment methods - ENGR 7189.02 - GTA Professional Development – teaching practicum (Active)

Related Goals

Program - Engineering Education (PH)

Skill-Cognitive - Create, teach, and assess courses and curricula

Outcome: Design and Implement Assessments

4. H. Design and implement evaluation/assessments of a variety of educational programming

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Clinical Skills/Experience

Outcome Category (Other): Generalization and Application

Assessment Methods

Direct - Other classroom assessment methods - ENGR 7189.02 - GTA Professional Development – teaching practicum (Active)

Related Goals

Program - Engineering Education (PH)

Program - Engineering Education (PH)

Skill-Cognitive - Create, teach, and assess courses and curricula

Outcome: Engage in Professional Activities

5. A. Engage in professional activities with attention to inclusion of multiple perspectives and demographics in order to create synergy in the midst of differences.

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Diversity

Outcome Category (Other): Professionalism (default for specialized skills and practices, e.g., patient care)

Related Goals

Program - Engineering Education (PH)

Perspectives/Attitudes - Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits

Outcome: Demonstrate a Mindset that Values Curiosity and Questioning

5. B. Demonstrate a mindset that values curiosity and questioning, finds and leverages connections across a wide range of ideas, and creates positive societal value

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Continuous Learning and Adaptability

Outcome Category (Other): Creative Thinking

Assessment Methods

Direct - Graduate - Candidacy/Qualifying Examination - Written document - engineering education oral candidacy exam (Active)

Related Goals

Program - Engineering Education (PH)

Perspectives/Attitudes - Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits

Outcome: Function on Diverse Teams

5. C. Function effectively on diverse, multidisciplinary teams

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Teamwork

Assessment Methods

Direct - Other culminating project - ENGR 7189.01 - GTA Preparation and Support – teaching practicum (Active)

Related Goals

Program - Engineering Education (PH)

Program - Engineering Education (PH)

Perspectives/Attitudes - Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits

Outcome: Communicate Effectively

5. D. Communicate effectively with a range of audiences using multiple modes and media

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Communication-Oral

Outcome Category (Other): Communication-Visual, Communication-Written

Assessment Methods

Direct - Other classroom assessment methods - ENGR 7881 - Engineering Education Seminar – discussion, interaction, and reflection with multiple stakeholders and audiences within seminar series
(Active)

Related Goals

Program - Engineering Education (PH)

Perspectives/Attitudes - Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits

Outcome: Handle Ethical Dilemmas

5. E. Recognize, analyze, and equitably engage with professional ethical dilemmas

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Ethics/Moral Reasoning

Outcome Category (Other): Professionalism (default for specialized skills and practices, e.g., patient care)

Assessment Methods

Direct - Graduate - Candidacy/Qualifying Examination - Written document - engineering education candidacy exam
(Active)

Related Goals

Program - Engineering Education (PH)

Perspectives/Attitudes - Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits

Outcome: Leadership

5. F. Demonstrate effective leadership skills

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Other): Leadership

Assessment Methods

Direct - Writing assignment - ENGR 7900 - Professional Development in Engineering Education – professional portfolio
(Active)

Program - Engineering Education (PH)

Related Goals

Program - Engineering Education (PH)

Perspectives/Attitudes - Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits

Outcome: Teamwork and Project Management

5.G. Apply appropriate principles to manage teams and projects

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Teamwork

Outcome Category (Other): Professionalism (default for specialized skills and practices, e.g., patient care)

Related Goals

Program - Engineering Education (PH)

Perspectives/Attitudes - Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits

Outcome: Empathy and Cultural Competence

5. H. Demonstrate empathy and cultural competence across professional interactions

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Cultural Awareness

Outcome Category (Other): Professionalism (default for specialized skills and practices, e.g., patient care)

Assessment Methods

Direct - Graduate - Candidacy/Qualifying Examination - Written document - engineering education oral candidacy exam (Active)

Related Goals

Program - Engineering Education (PH)

Perspectives/Attitudes - Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits

Outcome: Job Search and Career Advancement Skills

5. I. Prepare professional documents and demonstrate effective communication skills appropriate to a variety of job search and career advancement processes

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Professionalism

Outcome Category (Other): Communication-Oral, Communication-Visual, Communication-Written

Assessment Methods

Direct - Writing assignment - ENGR 7900 - Professional Development in Engineering Education – cv / resume / application development (Active)

Related Goals

Program - Engineering Education (PH)

Program - Engineering Education (PH)

Perspectives/Attitudes - Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits

Outcome: Lifelong Learning

5. J. Value and demonstrate commitment to continuing education and lifelong learning

Outcome Status: Inactive

Planned Assessment Year: Every Year

Outcome Category (Primary): Continuous Learning and Adaptability

Related Goals

Program - Engineering Education (PH)

Perspectives/Attitudes - Identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits

Introduction

Introduction:

The Ohio State University is constantly updating its curricula and programs. The recently established Department of Engineering Education (EED) will shape its practices and approach based on input from many of the engineering education stakeholders. This survey is directed towards potential and future students in order to help establish a student-centered program and curriculum within the OSU EED.

Targeted audience:

- Undergraduate students interested in Engineering Education graduate degrees
- Masters students interested in Engineering Education PhD
- Members of the Professional workforce seeking to expand knowledge or credentials
- Teachers, K12, and educational workforce seeking to expand knowledge or credentials
- Individuals interested in pursuing an education, certificate, or degree from the Department of Engineering Education at The Ohio State University

Consent Question: Do you allow the use of the survey for internal needs of The Ohio State University Department of Engineering Education?

Yes

No

Personal Background

What is your gender?

Male

Female

Other

I would prefer not to respond

What is your age?

Younger than 18

18-22

23-27

28-32

32+

I would prefer not to respond

Within which race do you identify. Check all that apply.

African American/Black

American Indian/Alaskan Native

Asian

European American/White

Hawaiian or Pacific Islander

Other

I would prefer not to respond

Are you Latino/a?

Yes

No

I would prefer not to respond

Are you a U.S. citizen?

Yes

No

I would prefer not to respond

I am from this region of the world:

- North America
- South America
- Europe
- Asia
- Africa
- Islandia

I am from this part of the country:

- The Northeast
- The Southeast
- The West Coast
- The Midwest
- The South

I am from outside the U.S.A.

Educational Background

Please describe your previous areas of study - answer as follows:
(college/department/major) - if you have no previous areas of study answer N/A

Please describe your current areas of study - please answer as follows:
(college/department/major) - if you are not currently enrolled answer N/A

What is the highest level of education you have completed?

- 0-2 years of undergraduate
- 3+ years of undergraduate
- Bachelors degree
- Masters

Currently I am a Ph.D. Student

Currently I am Ph.D. Candidate

Please select which most closely represents your average GPA in higher education:

Above 3.5

3 - 3.5

2.7 - 3

below 2.7

How would you describe your current university enrollment? Check all that apply.

Full-time

Part-time

Not enrolled

I am part of the professional workforce

What are your potential limitations for pursuing graduate education?

What is the highest level of education you are interested in pursuing? (please check all that apply).

Undergraduate Degree

Masters Degree

Doctorate

I would like to supplement my Degrees with Professional Certificates

Not Applicable

I would be interested in completing an online graduate degree with a distance learning format:

Strongly Agree

Agree

Somewhat agree

Neither agree nor disagree

Somewhat disagree

Disagree

Strongly disagree

I am interested in pursuing full time graduate education:

Strongly Agree

Agree

Somewhat agree

Neither agree nor disagree

Somewhat disagree

Disagree

Strongly disagree

During my graduate education I intend to have additional employment outside of the university (not including teaching, research, fellowships or other opportunities granted by the university)

Yes

No

Maybe

I do not know

Would you be interested in a compressed degree that would allow you to perform your professional responsibilities in parallel with degree completion? (example: Program for teachers with only a summer curriculum)

Yes

No

Engineering Education

I am aware that the field of Engineering Education exists, produces scholarly research, and produces Ph.D.s:

Strongly agree

- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

I am knowledgeable about the field of Engineering Education:

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

I have aspirations to contribute to the field Engineering Education:

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

I am interested in obtaining a degree from The Ohio State University Department of Engineering Education (EED):

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

I am interested in obtaining a degree in Engineering Education at a university other than The Ohio State University:

- Yes
- No
- I am not sure

Which programs of Engineering Education are you interested in? Please list.

My Pursuit.

I would be interested in a engineering education degree – where I am evaluated on scholarly teaching effectiveness:

Strongly Agree

Agree

Neither Agree nor Disagree

Disagree

Strongly Disagree

I would be interested in an engineering education degree – where I am evaluated on research performance:

Strongly Agree

Agree

Neither agree nor disagree

Disagree

Strongly disagree

I would be interested in a balanced degree with both scholarly teaching and research activities being equally evaluated:

Strongly Agree

Agree

Neither agree nor disagree

Disagree

Strongly disagree

I would be interested in a certificate in Engineering Education that would increase my engineering education knowledge without providing a full degree:

Strongly Agree

Agree
Neither agree nor disagree
Disagree
Strongly disagree

Degree Dynamics

What number of required courses should constitute a Master's level understanding of material?

1-5
6-10
10+
Classes do not correlate to degree level understanding.

What amount of structure do you most prefer in a class?

I prefer being left alone to learn and do my classwork
I prefer independence from the instructor
I prefer strong guidance and support from instructors
I prefer working together with my classmates to learn
I have no preference regarding class structure

I prefer my engineering education classes to be on campus and in-person as opposed to online (virtual, distance, and/or synchronous/asynchronous):

Strongly Agree
Agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Disagree
Strongly disagree

What percentage of course credits towards a graduate degree in engineering education should be taught from within an engineering education department?

- 0 to less than 25%
- 25 to less than 50%
- 50% to less than 75%
- More than 75%
- I have no preference

I believe the following are important to my degree in engineering education

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
To Identify, discuss, and address critical issues facing engineering education in alignment with stakeholder needs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To design, conduct, and critique research in engineering education	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To demonstrate, value, and apply engineering expertise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To create, teach, and assess courses and curricula	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To identify, demonstrate, and value appropriate personal and professional skills, mindsets, and traits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What number of required courses should constitute a Ph.D. level understanding of material?

- 1-5
- 6-10
- 10+
- Classes do not correlate to degree level understanding

Rank order how much weight the following requirements should carry with respect to engineering education degree attainment:

Course Credit

Impact within the field of Engineering Education

Qualifying/Candidacy Exams

Ph.D. Dissertation

Dissertation Proposal

Research Publications

Teaching Experience

Dissertation Oral Defense

Additional Degree Specialization (Globalization, Leadership, Motivation, etc.)

Are there any mechanisms/requirements for degree attainment not listed in the previous question that you feel are important to include? Please explain.

On a scale from 1-5 please use the sliding scale to rate the listed approaches to Research Advising and how each corresponds to academic success: (5 = corresponds very strongly, 0 = no correlation)

0 1 2 3 4 5

Close advising in hands-on approach

Balanced mentoring with hands-on and independent approach intertwined

Advising that is

hands-off and
affords much
independence and
self directed
research

On a scale from 0-5 to what extent are the listed activities important for EED professionals to acquire the skills necessary to succeed professionally?

0 1 2 3 4 5

International
Experience

External
Collaboration

Industry internships

Leadership Role
within Professional
Society

Rotations within
different OSU EED
Research
Laboratories

Discipline Based
Educational
Research

Grant Writing

Post-Degree
Employment
Opportunities

Availability of funds
supporting degree
completion

Informal
Partnerships

I believe the following should count towards graduate degree completion in engineering education:

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Research	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engineering Education Courses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conference Participation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Informal Learning Opportunities (outreach/engagement)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Research Publications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dissemination of one's work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Professional Society Leadership Roles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engineering Professional Practice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Classroom/Teaching Experience	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Annual Review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
International Experience	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

My Degree.

Please explain why you are interested in a Ph.D. within Engineering Education?

Which areas/specialization within EED do you anticipate being most critical to your future success: (Rate each independently)

0 10 20 30 40 50 60 70 80 90 100

Graduate Studies

Undergraduate Engineering

First Year Engineering

Problem/Project

Based Learning

Engineering
Leadership

Research Quality and
Methods

Diversity and
Inclusion

Engagement and
Outreach

Engineering Ethics

Informal Learning

Qualitative Research
Methods

Quantitative
Research Methods

Mixed Methods
Research

Evaluation and
Assessment

Cognitive Studies

Engineering and
Technical
Communications

K12 Engineering
Education

Faculty Development

Entrepreneurial
Mindsets

Education Policy

Rank your interest in the specializations/areas within Engineering Education: (5 = strong interest, 0 = no interest)

	0	1	2	3	4	5
Graduate Studies						
Undergraduate Engineering						
First Year Engineering						
Problem/Project Based Learning						
Engineering Leadership						
Research Quality and Methods						
Diversity and Inclusion						
Engagement and Outreach						
Engineering Ethics						
Informal Learning						
Qualitative Research Methods						
Quantitative Research Methods						
Mixed Methods Research						
Evaluation and Assessment						
Cognitive Studies						
Engineering and Technical						

Communications

K12 Engineering
Education

Faculty Development

Entrepreneurial
Mindset

Education Policy

Please list any specializations/areas within Engineering Education not included on the list in which you are interested:

The Ohio State University and the OSU EED

What are the factors that make The Ohio State University most appealing? Please rank.

Geographical location in Columbus, Ohio

University size

University reputation

College of Engineering reputation

The fact that OSU is a comprehensive university

I am not familiar with The Ohio State University

Other

If you answered other to the previous question, please explain. If not, proceed with this question left blank.

Please briefly explain why The Ohio State University is appealing.

What are the factors that make The Ohio State University Department of Engineering Education (EED) most appealing? Please rank.

Newly established Department

The Departments setting within The Ohio State University

The EED leadership, faculty, and/or staff

The EED's Development from the Engineering Education Innovation Center

I am not very familiar with the OSU EED

Other: Explain.

If you answered other to the previous question, please explain. If not, proceed with this question left blank.

Please briefly explain why The Ohio State University Engineering Education Department is appealing.

Closing

In this section please share any additional thoughts that you feel are important with respect to your needs and desires when considering enrolling in an engineering education department and that could be helpful to inform the development of the new engineering education graduate program.

Please let us know from where it was that you received this survey:

Email

etc.

etc.

If you would like follow up regarding your responses to this survey, please submit your email:

Thank you.

Thank you for participating in this survey.

Our website is: www.eed.osu.edu

If you are interested in being added to The Ohio State University Department of Engineering Education listserv please send an email to _____.

Click to write Choice 1

Click to write Choice 2

Click to write Choice 3



February 3, 2017

Dr. Monica Cox, Chair, Department of Engineering Education

Dr. Ann Christy, Engineering Education

The Ohio State University

Dear Drs. Cox and Christy,

This letter is to express the Department of Teaching and Learning's support of the Department of Engineering Education's (EED) proposed Ph. D. in Engineering Education program. We currently have an engineering education area within our STEM Ph. D. area of study and have been in collaboration with EED and its predecessor EEIC in its development and implementation. While our program has some learning experiences on post-secondary education, our program is mainly focused on preparing researchers to research in P-12 education settings. EED's proposed Ph. D. program expands the opportunities for OSU students to more fully include developing researchers to work in post-secondary engineering education settings. The program looks like a good complement to our program. We see a number of opportunities for students in either program to take courses in the other department

We look forward to continued collaboration with EED in both teaching and research.

Sincerely,

Dr. Christian Faltis

Chair, Department of Teaching and Learning

Budget for New Graduate Degree Programs

	Year 1	Year 2	Year 3	Year 4
Projected Enrollment				
Head-count full time				
Head-count part time				
Full Time Equivalent (FTE) enrollment				
Projected Program Income				
Tuition (paid by student or sponsor)				
Externally funded stipends, as applicable				
Expected state subsidy				
Other income (if applicable, describe in narrative section below)				
TOTAL PROJECTED PROGRAM INCOME:				
Program Expenses				
New Personnel				
<ul style="list-style-type: none"> • Faculty (e.g. tenure-track, clinical, professional) <ul style="list-style-type: none"> Full ____ Part Time ____ • Non-instruction (indicate role(s) in narrative section below) <ul style="list-style-type: none"> Full ____ Part time ____ 				
New facilities/building/space renovation (if applicable, describe in narrative section below)				
Tuition Scholarship Support (if applicable, describe in narrative section below)				
Stipend Support (if applicable, describe in narrative section below)				
Additional library resources (if applicable, describe in narrative section below)				
Additional technology or equipment needs (if applicable, describe in narrative section below)				
Other expenses (e.g., waived tuition and fees, travel, office supplies, accreditation costs) (if applicable, describe in narrative section below)				
TOTAL PROJECTED EXPENSE:				
NET				

Budget Narrative: (Use narrative to provide additional information as needed based on responses above.)

**ESTABLISHMENT OF A MASTER OF APPLIED
NEUROSCIENCE DEGREE PROGRAM**

COLLEGE OF MEDICINE

Synopsis: Approval to establish a Master of Applied Neuroscience degree program in the College of Medicine, is proposed.

WHEREAS the goal of the program is to develop a biomedical workforce with expertise in the rapidly expanding field of neuroscience, with the intent of preparing the highest caliber of students equipped to effectively serve in a senior research position or in an academic setting as an instructor to promote advances in biomedical research and education; and

WHEREAS the four-semester program will have a core didactic curriculum that is neuroscience-based; a more specialized program developed around specific career goals – a research laboratory career or a career in higher education; and a capstone project; and

WHEREAS the program will be housed in the Department of Neuroscience in the College of Medicine, and will be administered by a director, co-director and a graduate faculty committee; and no new facilities are required and no additional costs are anticipated; and has the support of the leadership of the College of Medicine; and

WHEREAS the proposal was reviewed by a joint committee of the Council on Academic Affairs and the Graduate Council, and then was approved by the full Council on Academic Affairs at its meeting on November 1, 2017; and

WHEREAS the University Senate reviewed and approved the proposal to establish a Master of Applied Neuroscience degree program on January 25, 2018:

NOW THEREFORE

BE IT RESOLVED, That the Board of Trustees hereby approves the proposal to establish a Master of Applied Neuroscience degree program.

M e m o r a n d u m

To: University Senate
From: Maria N. Miriti, Chair, Council on Academic Affairs
Subject: Master of Applied Neuroscience Degree Program
Date: January 8, 2018

A PROPOSAL FROM THE COUNCIL ON ACADEMIC AFFAIRS TO ESTABLISH A MASTER OF APPLIED NEUROSCIENCE DEGREE PROGRAM, COLLEGE OF MEDICINE

Whereas the goal of the program is to develop a biomedical workforce with expertise in the rapidly expanding field of neuroscience, with the intent of preparing the highest caliber of students equipped to effectively serve in a senior research position or in an academic setting as an instructor to promote advances in biomedical research and education; and

Whereas the 4-semester program will have a core didactic curriculum that is Neuroscience based; a more specialized program developed around specific career goals – a research laboratory career or a career in higher education; and a capstone project; and

Whereas the program will be housed in the Department of Neuroscience, College of Medicine, and will be administered by a Director, Co-Director, and a graduate faculty committee; and no new facilities are required and no additional costs are anticipated; and has the support of the leadership of the College of Medicine; and

Whereas the proposal was reviewed by a joint committee of the Council on Academic Affairs and the Graduate Council and then was approved by the full Council on Academic Affairs at its meeting on November 1, 2017,

Therefore be it resolved that the University Senate approve the proposal to establish a Master of Applied Neuroscience degree program and respectfully request approval by the Board of Trustees.

From: [Smith, Randy](#)
To: [Bishop, Georgia A.](#)
Cc: [Smith, Randy](#); [Reed, Katie](#); [Miriti, Maria](#); [Herness, Scott](#); [Schlueter, Jennifer](#); [Kent, K. Craig](#); [Clinchot, Daniel](#); [McPheron, Bruce A.](#); [Whitacre, Caroline](#); [Weisenberger, Jan](#); [Thompson, Blake](#); [Givens, Bennet](#); [Schweikhart, Sharon](#); [Lilly, Blaine](#); [Torma, Hannah](#); [Miner, Jack](#); [Oberdick, John](#); [Nelson, Randy](#); [Manderscheid, David C.](#); [Hadad, Christopher](#); [Steffensmeier, Janet](#); [Schmiesing, Ryan](#); [Hofherr, Michael B.](#); [Fink, Steven](#); [Krissek, Lawrence](#)
Subject: Master of Applied Neuroscience
Date: Thursday, November 2, 2017 9:41:08 AM
Attachments: [image001.png](#)

Georgia:

Following its review by the combined Council on Academic Affairs (CAA) and Graduate Council subcommittee, the proposal from the Department of Neuroscience, College of Medicine, to establish a Master of Applied Neuroscience degree program, was approved by the Council on Academic Affairs at its meeting on November 1, 2017. Thank you for attending the meeting to respond to questions/comments.

The proposal will now be sent to the University Senate with a request that it be included on the agenda for action at the Senate meeting on January 18, 2018. Professor Maria Miriti, Chair of CAA, will present the proposal but it is important that you or someone from the Department be there to respond to any substantive questions/comments. I will provide you with details as we get closer to that date. If approved by the Senate, we will request action on the proposal by the Board of Trustees at its meeting on February 2, 2018. Concurrently, Professor Scott Herness, Interim Dean of the Graduate School, will work with you on the steps for approval by the Ohio Department of Higher Education (ODHE).

Please keep a copy of this message for your file on the proposal and I will do the same for the file in the Office of Academic Affairs.

If you have any questions please contact Professor Miriti (.1) or me.

Congratulations on the successful completion of this important stage in the review/approval process!

Randy



W. Randy Smith, Ph.D.

Vice Provost for Academic Programs

Office of Academic Affairs

203 Bricker Hall, 190 North Oval Mall, Columbus, OH 43210

614-292-5881 Office

smith.70@osu.edu

TO: Randy Smith, Vice Provost for Academic Programs
FROM: Jennifer Schlueter, Faculty Fellow for Curriculum, Graduate School
DATE: 24 October 2017
RE: Proposal for a new tagged Masters in Applied Neuroscience

The Department of Neuroscience is proposing a new tagged Masters in Applied Neuroscience.

The proposal was received by the Graduate School in December 2015. It was reviewed by the combined GS/CAA Curriculum subcommittee, chaired by the Faculty Fellow, on 4 December 2015, and revisions were requested that same day. Revisions were received on 18 August 2016, and the proposal received its second review by the combined GS/CAA Curriculum subcommittee in November 2016. Revisions were requested on 20 December 2016. These revisions were received on 30 January 2017. The revised proposal received its third review by the combined GS/CAA Curriculum subcommittee on 6 February 2017, and revisions were requested on 7 February 2017. Revisions were received in summer 2017, and the proposal received its fourth review by the combined GS/CAA Curriculum subcommittee on 5 October 2017. It was forwarded it on to the Graduate Council for their review on 6 October 2017. The proposal was reviewed and approved at the Graduate Council on 23 October 2017. The positive results of this review were shared with the proposers on 24 October 2017.

1. DESIGNATION OF NEW DEGREE PROGRAM: Master's in Applied Neuroscience

INTRODUCTION

The goal of the proposed Master's in Applied Neuroscience is to develop a biomedical work force with expertise in the rapidly expanding field of Neuroscience. The intent is to prepare the highest caliber of students equipped to effectively serve in a senior research position or in an academic setting as an instructor to promote advances in biomedical research and education in general, and specifically in the growing field of Neuroscience. The intent is to provide students with a Master's level curriculum that will provide both the didactic course work as well as research and teaching training that will prepare students for careers requiring advanced biomedical training beyond the baccalaureate degree. A recent survey (<https://neurosciencemajor.osu.edu/careers-neuroscience>) by the Undergraduate Neuroscience Major at The Ohio State University (OSU) determined that graduates with a Bachelor of Science degree in Neuroscience found employment in several areas including, Pharmaceutical Sales, Laboratory Technician, Science Writer, Science Advocacy, Lab Animal Care Technician, Sales Engineer, Special Education Assistant, Health Educator/Community Health Workers, Public Policy and several other areas. In general these positions have salaries ranging from \$25,000 to \$44,000 per year.

The intent of developing the Applied Neuroscience Master's Degree is to prepare students for advanced placement in a large number of biomedical fields that require a Master's degree as the basis for employment or advancement. Based on various jobs websites (<https://www.indeed.com/q-Ms-Neuroscience-jobs.html>; <http://work.chron.com/can-masters-degree-neuroscience-4161.html>) graduates would be immediately prepared for careers including, but not limited to, Research Assistant or Research Associate in a scientific or clinical research laboratory, Senior Scientist in Pharmacology, Research Scientist in Human-Machine Interactions, Neuroscience Genomics Research Associate, Medical Science Liaison, Marketing Assistants, Computer Lab and/or Sales Assistants for biotechnical or pharmaceutical companies, Neuroimaging technicians, Science Teacher, Research and Teaching Administrator, Adviser in public and government Institutions, Academic journalist, Medical writer, Clinical data manager and Patent Agent. Salaries increased significantly in these fields ranging from \$73,000 to \$104,000. In addition, students who obtain a master's level education in Neuroscience will be well-prepared to enter programs that may require additional training including medicine, dentistry, nurse practitioner, physician's assistant, genetic counselor, biostatistician, speech-language pathologist, and public health. In summary, obtaining an Applied Neuroscience Master's degree from The Ohio State University will expand employment opportunities well beyond what is available to individuals with a Bachelor's Degree.

All students enrolled in the Master's in Applied Neuroscience will take rigorous academic courses that will comprise a select subset of the courses developed for students studying to receive their Ph.D. in the Neuroscience Graduate Program. This course work, described below, will serve as the foundation for the program and provide the essential didactic knowledge they will need to be viable for advanced positions. In addition to the didactic coursework, students will then have a more specialized program developed around their specific career goals. Some students will specifically want a research/laboratory based career whereas others may be interested in higher education. Students on a research oriented track will be given extensive training in laboratory techniques under the guidance of experienced basic science and clinical science researchers. Those with an interest in pursuing a career in higher education will be mentored by faculty with extensive teaching credentials. Additional course work, as appropriate to the tracks, will be included as described below.

Faculty

The faculty involved in this program all have P status in the Graduate School. They are experienced mentors, having trained numerous Ph.D students as part of the Neuroscience Graduate Program (NGP). They participate in the didactic courses and are well-prepared to take students in the proposed Master's program into their laboratories for training. In addition, many of the faculty in the Department of Neuroscience participate in teaching courses in the Neuroscience Undergraduate Major. This includes faculty who teach two of the three required core courses in the curriculum with enrollments of 140 - 190 students/semester as well as several elective courses. These faculty will serve as mentors to students

interested in pursuing a pathway that will allow them to teach neuroscience courses at institutions of higher education.

The proposal is to make this a 4 semester program. A minimum of 30 semester credit hours will be required. To be in good standing in the Graduate School, a student must maintain a graduate cumulative point-hour ratio (CPHR) of 3.0 or better in all graduate credit courses and must maintain reasonable progress toward Graduate School or graduate program requirements.

CRITERIA FOR ADMISSION

Admission to the program would be limited to students with a baccalaureate from accredited institutions. Additional criteria would include demonstration of high promise based on their current professional activities. The minimum GPA for admission would be 3.0, although on average we would expect higher GPAs in the area of 3.4 – 4.0. GRE scores would be expected to be >70% in verbal and quantitative examinations. The proposed class size is initially 30 – 50 students. This likely would grow as the program becomes established.

DESCRIPTION OF THE PROPOSED CURRICULUM

The Master's in Applied Neuroscience at OSU will have a core didactic curriculum that is Neuroscience based. The objective is to provide advanced level knowledge and skills that will be valuable for practicing professionals. Regardless of whether students choose a career pathway in research or academia, they will need basic knowledge of the organization and function of the nervous system and how it relates to disease processes. This core curriculum (NeuroSc 7001, 7002, 7050, 7100, 7200.01, and 7890) is made up of well-established courses taken by students enrolled in several graduate programs including the Neuroscience Graduate Program, Biomedical Science Graduate Program, Molecular, Cellular & Developmental Biology Graduate Program, etc. Courses also are taken by undergraduate students in the Neuroscience Honor's Program, and students in other biologically based Master's Programs (e.g., Exercise Physiology, Anatomy). Finally, they are applicable for students seeking a graduate minor in Neuroscience. Most of the courses needed for this degree are already approved. Some will need to be developed specific to the Applied Master's degree. They syllabi for established and preliminary syllabi for courses to be developed are included in the Appendix.

ESTABLISHED COURSES

NeuroSc 7001: Foundations of Neuroscience I. This course provides students with an understanding of basic cellular, molecular, neurophysiological, and neuropharmacological principles. It also relates these principles to the basic organization of the normal and diseased nervous system. This is a letter graded course.

NeuroSc 7002: Foundations of Neuroscience II. This course covers basic neuroanatomy as well as the organization of select systems in the nervous system including motor, sensory, autonomic, and higher cognitive centers. It is designed to provide students with an understanding of how neural systems are organized and function and to relate this information to basic principles of behavior. This is a letter graded course.

NeuroSc 7050: Neurobiology of Disease. The intent of this course is to familiarize students with clinical and basic science research being carried out related to various diseases of the nervous system. The course also helps students develop critical thinking skills by having them discuss a relevant paper on each topic and to have them write an NIH style grant in which they develop a research project related to a specific neurological disease. This is a letter graded course.

NeuroSc 7100: Current Topics in Neuroscience. This course reviews recent literature under the direction of an expert in the field. They will be asked to critically evaluate the assigned papers with respect to the hypothesis of the study, techniques, writing style, and whether the data supports the conclusions. Critical thinking and ability to interpret relevant Neuroscience literature is essential for all types of positions. The papers selected for the course are correlated with material presented in NeuroSc 7001. This is an S/U graded course.

NeuroSc 7200.01: Neuroscience Laboratory. This is a laboratory component of NeuroSc 7002. The goals of this course are to familiarize students with the anatomy of the human brain, to relate anatomical material to radiographic images, and to use case studies to provide further understanding of human neuroanatomy and brain function. This is a letter graded course.

NeuroSc 7890: Seminar in Neuroscience. In this course, selected topics in neuroscience are presented by faculty, invited speakers from outside the university, and by students enrolled in the course. In addition, students discuss papers related to the research of outside speakers prior to their presentations. This is a letter graded course.

Statistics. If students have not had a statistics course as an undergraduate they will be required to take one of several courses offered by other departments at OSU. If they demonstrate proficiency in this area, the course will be waived. Demonstration of proficiency will be determined on a written examination that tests basic statistical concepts.

Electives: Students in both the research and education track may elect to take additional electives related to their specific career goals. Examples include but are not limited to:

Biology 6001: College Biology Teaching
EDUCST 7406: Course Design for Higher Education
ESEPSY 7404: College Teaching
BMI 5710 - Introduction to Biomedical Informatics
BIOETHC 6000—Bioethics Theory and Foundations

NEW COURSES TO BE SUBMITTED FOR APPROVAL

NeuroSc 7000.1: Research Techniques. This will provide the necessary skills for students who have a goal to work in a basic science or clinical research laboratory either in academia or industry. They will be assigned to laboratories where they will become competent in various lab skills including but not limited to animal handling, PCR, immunohistochemistry, genetic screening, CRISPR, maintenance of lab notebooks, basic data analysis, microscopy, etc. This will be a letter graded course.

NeuroSc 7000.2: Education Techniques. Students intent on a career in an education setting (e.g., high school science, neuroscience courses at community or small liberal arts colleges) would be paired with a faculty member engaged in didactic teaching at the undergraduate and/or graduate level. These students will be assigned to a mentor with a primary focus in education where they will become competent in developing courses, giving lectures, grading exams, counseling students, etc. These will be a letter graded course.

NeuroSc 7530: Bioethics.

The intent of this course is to discuss issues related to: Research and Research Misconduct, Ethical issues involving human and/or animal subjects, HIPPA/FERPA regulations, Applied Medical Ethics, IRB/IACUC regulations, Authorship and publication issues, Data management and record keeping, Peer review; Confidentiality, Issues of collaboration, Conflict of interest, Ethical Conduct Toward Students/Peers, Ethics of Teaching. Readings will be assigned prior to each session and students will be given a short quiz at the beginning of each session on the topic to ensure they have reviewed the material. This also should enhance participation during each session. We will work with faculty in the Center for Bioethics in the College of Medicine to develop this course. This will be a letter graded course.

NeuroSc 7600: Capstone Project

The Capstone projects is designed to demonstrate that the students are able to think critically, solve challenging problems, and develop skills such as oral communication, public speaking, research skills, media literacy, teamwork, planning, self-sufficiency, or goal setting—i.e., skills that will help prepare them for careers in the biomedical science field. The projects will require students to apply skills or investigate issues and to demonstrate research or education proficiency.

The objective of the capstone course is to allow the students to synthesize and integrate the knowledge from their didactic course work with laboratory and teaching skills. The goal of the capstone course is designed to evaluate the student's ability to problem solve, carry out a critical analysis of scientific procedures and/or educational material, and their ability to communicate this information to their peers and instructors in the degree program. The course will determine if students are prepared to critically assess the literature, demonstrate competence in various lab skills or educational strategies analyses. The Capstone document will also constitute a portion of the University's required master's examination (described below). The ultimate educational goals of the Capstone Project is to demonstrate learning and proficiency, enhance student confidence and self-perception, and solidify educational and career aspirations.

The proposed sequence of core courses is as follows.

Summer Semester: (7 Credit Hours)

NeuroSc 7530 - Bioethics – 3 credit hours

NeuroSc 7000.X – Research/Education Techniques –4 credit Hours

Autumn Semester (15 Credit Hours):

NeuroSc 7001 Foundations of Neuroscience I – 6 credit hours

NeuroSc 7100 – Current Topics in Neuroscience – 1 Credit hour

NeuroSc 7000.X – Research/Education Techniques --6 credit hours

NeuroSc 7890 – Seminar Topics in Neuroscience – 2 Credit Hours

Spring Semester (15 Credit Hours)

NeuroSc 7002 Foundations of Neuroscience II – 6 credit hours

NeuroSc 7200.01 Neuroanatomy Laboratory (half semester) - 1 Credit Hour

NeuroSc 7050 – Neurobiology of Disease – 3 Credit Hours

NeuroSc 7000.X – Research/Education Techniques – 4 credit Hours

NeuroSc 7890 – Seminar Topics in Neuroscience – 1 Credit Hours

Summer Semester (3 credit hours):

NeuroSc 7600: Capstone Project (3 credit hours)

The minimum number of credit hours a student will earn is 40 (7 + 15 + 15 +3 = 40) although some will earn more if they choose to take electives as noted above.

EVALUATION: In addition to their letter grades in the core courses, students will receive a written evaluation at the end of each semester from their mentor (NeuroSc 7000.X). The comments will be reviewed by the Master's Committee and discussed with the students.

FINAL EVALUATION OF STUDENTS - MASTER'S EXAMINATION

Committee: The Master's Examination Committee will be composed of at least two Graduate Faculty members including the student's mentor. The student's advisor may invite other graduate faculty members to participate as members of the committee. The advisor of each master's student will hold membership at the category M or P level in the Neuroscience Graduate Program. All members of the Master's Examination Committee will be present during the oral portion of the examination and will participate fully in questioning the student as well as in the discussion and decision on the result.

Examination: The final examination will consist of both written and oral components to evaluate students. For the written portion, students will be asked to use the document from their Capstone Project as the written document for the Master's Examination. They will submit a draft to the Master's Examination Committee which must be approved by all members. In general, the written portion of the

examination will consist of a detailed report of research they carried out in their mentor's lab. This would include hypothesis development, background of the project, methods used to test the hypothesis, results, inclusion of appropriate citations and discussion of the findings. For students in the education track, they would be expected to develop a new course on paper, including rationale for the course, syllabus, study plans, methods of evaluation of students and sample lectures.

Evaluation: After submission, the full paper will be reviewed by members of the Master's Examination Committee. When it is approved, students will have 2 weeks to prepare for an oral defense of their paper. At the oral defense, the focus will be on the paper itself, but topics from any of the courses they have taken may be included. The advisor will serve as the chair of the oral defense. Upon completion of the oral examination the Examination Committee will determine if the student has adequately addressed all questions and vote to pass or not pass the student.

ADMINISTRATIVE ARRANGEMENTS FOR THE PROPOSED PROGRAM

The Department of Neuroscience within the College of Medicine will be the administrative unit that has primary responsibility for administering the program. The Director, co-director, and a committee of graduate faculty will have primary responsibility for developing a handbook that specifically defines the requirements and responsibilities of faculty and students in accordance with the Graduate School Handbook. They also would be responsible for monitoring student progress. In addition to those duties specified in the Graduate School Handbook, the Neuroscience Master's Committee will develop and evaluate the curriculum, establish program policies, standards, and procedures, screen applicants for admission to the program and make final determinations on admission, approve programs of study (as to general program requirements) for students in the program, conduct reviews of students at the end of each semester, receive and act on petitions from graduate students, hear and respond to graduate student grievances, and conduct any other program business that may arise.

EVIDENCE OF THE NEED FOR THE PROGRAM

Whereas several Ohio Universities offer Ph.D. degrees in Neuroscience that are primarily focused on a career in research, there are few Master's degree programs. Two of note are

Kent State University offers a Master's of Science in Neuroscience. Although it is defined as a Master's degree, preference is given to students applying for the Ph.D. Program. The description suggests that the Master's degree is given as a terminal degree for students that complete the core course work and who also have some research experience but for whatever reason choose to end their graduate training at that point.

Wright State University offers a Master's of Science in Physiology and Neuroscience. The purpose of the master's degree is to provide the student with a strong research-oriented background in one of several areas of physiology, biophysics, or neuroscience.

The Master's in Applied Neuroscience at OSU would have a core curriculum that is Neuroscience based. However, it also will have components that would specifically focus on individual student needs. Depending on individual student interests, we will propose different rotations that they could enter to further help them in achieving their future career goals in research or teaching as described above.

In summary, this would be a unique program. It will allow students to explore different possibilities in a variety of biomedical careers with a neuroscience emphasis. Successful students would receive a Master's degree at the end of the program which is a tangible acknowledgement that they have a certain level of expertise in a very important and rising biomedical field of study increasing their marketability, and their likelihood of obtaining a lab, academic, or industry related position. Students successfully completing the program would receive a letter of recommendation and a personal assessment.

SPECIAL EFFORTS TO ENROLL AND RETAIN UNDERREPRESENTED GROUPS

The proposed major would critically evaluate applications from under represented students and make every effort to ensure they are included in the class. For recruitment, we plan to specifically target several colleges within Ohio (e.g., Central State University, Wilberforce) that are Historically Black Colleges.

Information on the program in the form of posters, brochures and website information would be sent to these schools. All attempts will be made to personally contact faculty advisors in majors such as Biology, Psychology and Neuroscience in order to establish a working relationship between our program and their school. We plan to personally visit these schools for events including career days or research days to discuss the degree, how it could help them find better employment, and encourage qualified students to apply. We also will advertise in minority-oriented media. Included in the media will be images that reflect diversity in the program (e.g., women, African-Americans, Asian Americans). We will also provide information on the importance of diversity at The Ohio State University and resources available to them outside the Department of Neuroscience (e.g., Office of Diversity and Inclusion, Hale Black Cultural Center, Leadership Initiatives for Women of Color, Latino and Latin American Space for Enrichment and Research, Student Life Multicultural Center). Another goal would be to work with students to help them find financial support that may be offered by groups or agencies that focus on supporting underrepresented individuals. Finally, we will encourage them to attend the Graduate and Professional Student Recruitment Initiative which is attended by minority students who demonstrate an interest in graduate programs at The Ohio State University.

Retention of all students in the program is important. An important factor in retaining students is mentoring. Students will be assigned to labs with experience in mentoring undergraduate/early graduate students. We now have extensive experience in this area due to our involvement in the Undergraduate Neuroscience Major. Faculty in the Department have mentored 65 undergraduate students. In part, the success of this mentoring relationship is evidenced by the fact that undergraduate students from labs of our faculty have presented data at the Denman Research Forum. In the last 3 years, 8 students have received 1st, 2nd, 3rd, or 4th place awards. They also have presented at the Neuroscience Research Day and the College of Medicine Research Day. Students also are co-authors on faculty papers. This demonstrates that our faculty are excellent in mentoring students at all levels and in training them in lab skills. For underrepresented students, we will carefully monitor their progress and offer assistance as needed in the way of tutors, one-on-one counseling, and meeting with peers from this program or others with a similar focus. The focus of the program is to help students expand their professional development and to provide the necessary skills needed to make them more competitive and resilient.

AVAILABILITY AND ADEQUACY OF THE FACULTY AND FACILITIES AVAILABLE FOR THE NEW DEGREE PROGRAM.

No new facilities are required. Involved faculty will be those with graduate status in the Neuroscience Graduate Program. Individual faculty will be identified based on the needs of the program each year.

NEED FOR ADDITIONAL FACILITIES AND STAFF AND THE PLANS TO MEET THIS NEED.

The program would need an Administrative Associate to support the operational aspects of the program. This individual would be a staff member in the Department of Neuroscience. In addition, we will need to support 4-5 Teaching Assistants. As the program grows, we may need to hire part-time lecturers.

PROJECTED ADDITIONAL COSTS ASSOCIATED WITH THE PROGRAM AND EVIDENCE OF INSTITUTIONAL COMMITMENT AND CAPACITY TO MEET THESE COSTS.

No additional costs are anticipated at this time. This degree program has the support and commitment of the Dean for Medical Education in the College of Medicine. His letter is attached to the submission.

CONCURRENCE.

Concurrence was obtained from the director of the Neuroscience Graduate Program. This program only offers a Ph.D. degree and is research based. It is not in conflict with this proposed Master's Degree Program. Dr. Oberdick's letter is attached.

APPENDIX 1

GENERAL PROGRAM GOALS

Upon completion of the Masters of Applied Neuroscience, students should attain:

1. advanced knowledge in subject matter relevant to the field of Neuroscience including cell and molecular neuroscience, neuroanatomy, neurophysiology, behavioral neuroscience, and translational neuroscience.
2. a working understanding of the scientific method as well as laboratory and/or teaching skills relevant to the field of Neuroscience.
3. knowledge and comprehension of statistics and experimental design.
4. knowledge and comprehension of the neuroscience research and education literature
5. a sense of responsibility as well as an understanding of the ethical dimensions of the discipline of Neuroscience. Students should develop ethical behaviors, cultural sensitivity, teamwork, and display professional conduct appropriate for an individual in a research or academic area.
6. verbal and written communication skills for teaching and interactions with peers within the scientific community

LEARNING OBJECTIVES

The general program goals will be measured by the following learning objectives.

1. Students will demonstrate competency in attaining advanced knowledge in neuroscience by:
 - a. Posting final grades \geq B in the base curriculum.
 - b. Demonstrating their ability to apply this knowledge to other program goals such as interpreting literature, conveying this information to others in a classroom setting, applying it to their research experiences, and incorporating the information into formal and informal discussions with their peers or other faculty in the program.
- 2A. Students will demonstrate competency in understanding the scientific method as it relates to their lab efforts by their ability to:
 - a. Follow a protocol that includes all steps in the procedure and demonstrate competency in preparing all reagents, equipment, and supplies needed to complete each step in the protocol.
 - b. Complete procedures in a timely manner.
 - c. Trouble shoot if there are unexpected problems that arise resulting in failure of an experiment.
 - d. Analyze data generated from procedures carried out in the laboratory.
 - e. Keep proper notes in a notebook (online or paper).
 - f. Discuss results with their mentor and/or other members of the lab.
 - g. Design the next set of experimental procedures to be carried out.
- 2B. Students will demonstrate competency in understanding educational theory by their ability to:
 - a. Prepare lectures for a course which will be reviewed by the mentor.
 - b. Present lectures to the mentor and following guidance for modifications.
 - c. Present lectures to a class at an appropriate level for the student audience.(i.e., undergraduate students, graduate students).
 - d. Review the evaluation of the presentation with the mentor and make appropriate changes.
 - e. Evaluate students in the class through tests to determine if information presented is consistent with student scores.
 - f. Schedule appointments with students to review material presented and answer their questions.

3. Students will demonstrate competency in statistics by:
 - a. Selecting appropriate tests during data analysis as confirmed by their mentor
 - b. Assessing the quality of an exam question based on Difficulty and Discrimination Scores and revising questions as needed.

4. Students will demonstrate competency in understanding scientific or educational literature by:
 - a. Explaining the purpose and goals of a given study.
 - b. Critically assessing results of a given study.
 - c. Determining the reproducibility of the data.
 - d. Judging the relevance of the study relative to their ongoing studies.
 - e. Discussing the literature with peers and/or faculty during seminars, lab meetings, or one on one sessions.

5. Students will demonstrate competency in professional and ethical behavior, cultural sensitivity, and teamwork by:
 - a. Demonstrating co-operation with others in the laboratory or classroom
 - b. Recognizing and responding to constructive criticism from their peers, mentors, and faculty.
 - c. Demonstrating a willingness to assist others in the laboratory or classroom.

6. Students will demonstrate competency in verbal and written communication skills for teaching and interactions with peers within the scientific community by:
 - a. Preparing presentations which will be reviewed by their mentors and members of the Master's Committee.
 - b. Presenting data at local (e.g., Neuroscience Research Day) and where possible national meetings (e.g., Annual meeting of the Society for Neuroscience).
 - c. Employ feedback from those reviewing or attending the presentation.
 - d. Successfully conveying to their Master's Examination Committee their neuroscience knowledge base in both written and oral presentations.
 - e. Participate in discussions during seminars, laboratory or educational meetings.
 - f. After completing an experiment, they will discuss the data with their mentors or other knowledgeable members of the lab to determine if they understand the results of their studies.

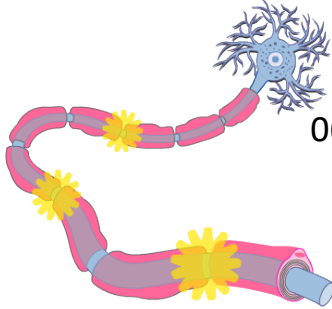
Long term Assessment of the Program

We will track student success in gaining employment. This will be essential for evaluating the effectiveness of the program. Periodically, alumni survey will be sent to graduates of the program requesting information on their current positions.

Appendix 2 – Syllabi

ESTABLISHED COURSES

Foundations of Neuroscience I



NGSP 7001

06 credit hour Fall Semester, 2016

1175 Graves Hall

8:30AM -9:50 AM

Course Directors: Dr. Candice Askwith and Dr. Christine Beattie

Module Leaders

Basic Neurophysiology Module A Dr. Candice Askwith	Cellular and Molecular Module B Dr. John Oberdick	Neurotransmission and Glia Module C Dr. Min Zhou	Neurodevelopment Module D Dr. Christine Beattie
4066B Graves Hall	226A Rightmire Hall	4066C Graves Hall	190 Rightmire Hall
(614) 688-7943	(614) 292-8714	(614) 366-9406	(614) 292-5113
askwith.1@osu.edu	oberdick.1@osu.edu	min.zhou@osumc.edu	beattie.24@osu.edu

Course Objectives: To develop a working knowledge of the cellular, molecular, and neuro-physiological principles fundamental to neuroscience research and relate these principles to the normal and diseased nervous system. The course will consist of four modules. Module A will provide knowledge of neurophysiology: the ionic basis of electrical excitability of neurons, action potentials, synaptic transmission, and basic biophysics of neurons. Module B will cover the cellular and molecular aspects of the nervous system. Module C will cover more advanced topics such as neurotransmitter systems and the fundamental mechanisms of neuronal and glial communication. Module D will convey a foundational understanding of how the nervous system develops.

Text and Website: A textbook is not required; Relevant chapters found in any basic Cell Biology, Neuroscience, or Development textbook would be an excellent supplement. For neurophysiology, and basic neuroscience text book such as those authored by Kandel, Bear, Haines, Mathews, Nicholls, Purves, or Zigmond would contain chapters with relevant information. For cell and molecular biology, text books authored by Squire, (Fundamental Neuroscience) or Cell/Molecular Biology texts by Alberts or Roberts. For neurodevelopment, "Development of the nervous system" (Sanes, Rah, and Harris-available at the Health Sciences Library). **Our web site is:** <http://carmen.osu.edu/>.

Student Evaluation: Three Exams (33.33% each) taken in the classroom.

#	Date	Topic	Instructor	Module/ Leader
1	Wed 8/24/2016	<i>Course Overview</i> /Membrane Potential and Ion Channels	C. Askwith/ C. Beattie askwith.1@osu.edu	
2	Fri 8/26/2016	Ionic currents and Ohms Law	C. Askwith	
3	Mon 8/29/2016	Ionic Basis of the Action Potential	G. Bishop bishop.9@osu.edu	
4	Wed 8/31/2016	Basic Electrophysiology Techniques	G. Bishop/C. Askwith	
5	Fri 9/02/2016	Propagation/Modulation of Action Potentials	G. Bishop	
	Mon 9/05/2016	NO CLASS	Labor Day	
6	Wed 9/07/2016	Synaptic Potentials	C. Askwith	
7	Fri 9/09/2016	Synaptic Integration	C. Askwith	
8	Mon 9/12/2016	Synaptic Plasticity: LTP/LTD	C. Askwith	
9	Wed 9/14/2016	Advanced Methods in Neurophysiology	C. Askwith	
	Fri 9/16/2016	EXAM 1		
10	Mon 9/19/2016	The Nucleus and Chromatin Structure	J. Oberdick oberdick.1@osu.edu	
11	Wed 9/21/2016	Transcription Factors and Transcriptional Networks in Neuroscience	J. Oberdick	
12	Fri 9/23/2016	Protein Synthesis and Translational Control	C. G. Lin lin.492@osu.edu	
13	Mon 9/26/2016	Protein Sorting and Trafficking	C. G. Lin	
14	Wed 9/28/2016	Axonal transport and the cytoskeleton of nerve cells I	A. Brown brown.2302@osu.edu	

#	Date	Topic	Instructor	Module/ Leader
15	Fri 9/30/2016	Axonal transport and the cytoskeleton of nerve cells II	A. Brown	
16	Mon 10/03/2016	Signaling Pathways I	Chen Gu gu.49@osu.edu	
17	Wed 10/05/2016	Signaling Pathways II	K. Obrietan obrietan.1@osu.edu	
18	Fri 10/07/2016	The Mitochondria	J. Oberdick	
19	Mon 10/10/2016	High-Throughput DNA Sequencing and In Silico Applications	J. Oberdick	
	Wed 10/12/2016	EXAM 2		
	Fri 10/14/2016	NO CLASS	Autumn Break	
20	Mon 10/17/2016	Cell Biology of the Synapse	J. Jontes Jontes.1@osu.edu	
27	Wed 10/19/2016	Electrical Synapses	G. Bishop	
21	Fri 10/21/2016	Excitatory and Inhibitory Amino acids	C. G. Lin	
22	Mon 10/24/2016	Catecholamines: Dopamine, Epinephrine	H. Gu gu.37@osu.edu	
23	Wed 10/26/2016	Acetylcholine, Serotonin, Histamine	R. T. Boyd boyd.16@osu.edu	
24	Fri 10/28/2016	Neuropeptides, ATP, and Other Neurotransmitters	C. Askwith	
25	Mon 10/31/2016	Glia and Myelination	D. McTigue dana.mctigue@osumc.edu	
26	Wed 11/02/2016	Astrocyte Physiology	M. Zhou min.zhou@osumc.edu	
28	Fri 11/04/2016	Cell Survival and Death	S. Yoon yoon.84@osu.edu	
29	Mon 11/07/2016	The extracellular matrix and axonal injury	Y. Shen yingjie.shen@osumc.edu	

#	Date	Topic	Instructor	Module/ Leader
	Wed 11/09/2016	EXAM 3		
	Fri 11/11/2016	No Class	Veterans Day	
30	Mon 11/14/2016	Overview of Nervous System Development and Neural induction	C. Beattie beattie.24@osu.edu	
31	Wed 11/16/2016	Polarity and Regionalization	J. Oberdick	
32	Fri 11/18/2016	Neuro and Gliogenesis	A. Fischer fischer.412@osu.edu	
33	Mon 11/21/2016	Determination and Differentiation	C. Beattie	
	Wed 11/23/2016	NO CLASS	Thanksgiving	
34	Fri 11/25/2016	NO CLASS	Thanksgiving	
35	Mon 11/28/2016	Mechanisms of Axon Guidance	C. Beattie	
36	Wed 11/30/2016	Target Selection and Topographic Maps	C. Beattie	
37	Fri 12/02/2016	Synapse Formation and Elimination	C. Beattie	
38	Mon 12/05/2016	Stem Cells	A. Fischer	
39	12/07/2016	Methods in Neuroscience	C. Beattie/ Oberdick	
Finals Week December 09th-15th (Fri-Thurs) EXAM 4 To Be Determined				

Neuro 7100 Paper Discussion Class format

Where: Graves 1165

When: 9:00-10:15 AM Tuesday mornings

Course Directors: Dr. Min Zhou and Dr. Andy Fischer

1. The lectures for 7100 will discuss a relevant, current paper the week following their presentation in NeuroSc 7001 by individuals giving the lectures.

2. Lecturers are responsible for selecting a paper and sending a PDF of the paper to Dr. Zhou at least 1 week before the discussion.
3. Lecturers will provide a PPT presentation of the figures.
4. Lecturers should include PPT schematic diagrams that explain any crucial or novel techniques used in the paper.
5. Students will volunteer or be called upon to interpret and discuss the figures.
6. Students are responsible for understanding the motivation behind the paper and be able to set up the paper and discuss all figures.
7. Lecturers will interject as needed to add relevant information, provide clarity for an unfamiliar method, clear-up any misconceptions, direct students attention to a missed point, etc.
8. It is expected that a student-led discussion will ensue around the questions provided by the lecturer.
9. Lecturers and course directors will ensure that all students are participating and will call on students if necessary.

Schedule:

Sept 1 - Overview
Sept 8 - Askwith
Sept 15 – Bishop
Sept 22 - Oberdick
Sept 29 – Brown
Oct 06 – Obrietan
Oct 13 - Jontes
Oct 20-break SfN
Oct 27 - Lin
Nov 3 - McTigue
Nov 10 - Zhou
Nov 17 - Beattie
Nov 24 -Fischer

**NeuroSc/Dent 7002: FOUNDATIONS OF NEUROSCIENCE II
(6 CR HOURS)
SPRING SEMESTER 2017**

FACULTY

Dr. Georgia Bishop	3187 Graves Hall	2-8363	bishop.9@osu.edu
Dr. Susan Travers	4153 Postle Hall	2-7619	travers.3@osu.edu
Dr. Derick Lindquist	049 Psychology Building	2-2236	lindquist.40@osu.edu

CLASSROOM: 1024 GRAVES HALL -SOUTHWEST (9TH AVENUE) SIDE OF GRAVES HALL ON THE FIRST FLOOR.

LECTURE FORMAT: Lectures will be given M, W, and Th from 8:30-10:00 AM. These are intended to provide an **overview** of the structure and function of the nervous system as well as **general concepts of the organization of a region/system**. They are not intended to be all inclusive. Students will be expected to read the textbook for supplemental information.

SUGGESTED TEXTBOOKS:

Nolte **The Human Brain, 6th Edition: An Introduction to Its Functional Anatomy**
Kandel, et al. **Principles of Neural Science, 4th Edition**. McGraw-Hill Publishers
Squires et al., **Fundamental Neuroscience, Third Edition** Academic Press.

EXAM FORMAT: Individual instructors will prepare questions from their lectures. The number of questions will be proportional to the amount of time the instructor lectured. The written portion will consist of short answer, multiple choice, and fill in the blank questions. The exams are not cumulative. Each will cover material presented since the last exam.

Final Grade: Your final grade will be based on the total number of points you accumulate relative to the number of points available from all exams.

ACADEMIC INTEGRITY (ACADEMIC MISCONDUCT)

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University's Code of Student Conduct, and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University's Code of Student Conduct and this syllabus may constitute "Academic Misconduct." The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the university, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's Code of Student Conduct is never considered an "excuse" for academic misconduct, so I recommend that you review the Code of Student Conduct and, specifically, the sections dealing with academic misconduct. If I suspect that a student has committed academic misconduct in this course, I am obligated by University Rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include suspension or dismissal from the University and a failing grade in this course. If you have any questions about the above policy, please contact me. Other sources of information on academic misconduct (integrity) include: COAM's web page (<<http://oaa.osu.edu/coam/home.html>>) "Eight Cardinal Rules of Academic Integrity" (<<http://www.northwestern.edu/uacc/8cards.html>>).

DATE	TOPIC	LECTURER
1/9	Introduction to Course, Terminology & Overview of Nervous System	Bishop
1/11	Arterial and Venous supply to CNS; Ventricles and flow of CSF	Bishop
1/13	Peripheral Nervous System; Functional Components of Nerves Autonomic Nervous System	Bishop
1/16	No Class MLK holiday	
1/18	Cranial nerves – components and peripheral distribution	Bishop
1/19	Anatomical and Functional Organization of the Spinal Cord	Lerch
1/23	Brainstem I	Travers
1/25	Brainstem II	Travers
1/26	Organization of Diencephalon (Thalamus) and Telencephalon	Bishop
1/30	EXAM 1 Covers material from 1/9 through 1/26	
2/1	Principles of Sensory Processing and Coding	Travers
2/2	Somatosensory System: transduction touch	Travers
2/6	Pain	Travers
2/8	Taste	Travers
2/9	Peripheral Muscle Receptors and spinal cord reflexes Descending pathways that control motor neurons	Bishop
2/13	Vestibular System	Bishop
2/15	Cerebellar Control of Movement	Bishop
2/16	Basal Ganglia Control of Movement	Bishop
2/20	EXAM 2 Covers material from 2/1 through 2/20	
2/22	Hypothalamus – General Organization	Obrietan
2/23	Circadian Rhythms	Obrietan
2/27	Reticular Formation – General Overview and Chemically Defined Pathways	Bishop
3/1	Disruptions of Circadian Rhythms	Nelson
3/2	Cerebral Cortex: Functional Organization of Association Areas	Givens

3/6	Neuroendocrine Function	Leuner
3/8	Limbic System: Overview and Aggression	Weil
3/9	Hippocampus: Current concepts on function (Memory, Epilepsy)	Weil
3/13-3/17	SPRING BREAK NO CLASS	
3/20	Psychiatric Disorders: Schizophrenia	Coutellier
3/22	Behavioral Genetics	Motti
3/23	Gene Therapy	Motti
3/27	EXAM 3 Covers Material from 2/22 through 3/22	
3/29	Sexual Dimorphism	Lenz
3/30	Sleep Circuits	Weil
4/3	Neurobiology of Learning and Memory	Lindquist
4/5	Stress – Overview of Neural Systems	DeVries
4/6	Stress – Autonomic control	DeVries
4/10	Interactions between Nervous System and Immune System	Godbout
4/12	The Aging Nervous System	Wenk
4/13	Drugs of Abuse	Gu
4/17	fMRI studies in Behavior	Leber
4/19	Study Day	
4/20	EXAM 4 Covers material from 3/23 through 4/17	

NEUROSCI 7200.01 NEUROSCIENCE LABORATORY

LAB/DISCUSSION SCHEDULE

Course Directors: Dr. Georgia Bishop and Dr. Susan Travers

Lab Sessions will be in room **285 Hamilton Hall**, unless otherwise noted. They will be held on Wednesdays from 10:15-noon. Gloves will be provided. Students should bring a probe, scissors, forceps, Nolte textbook which will be the reference atlas. You also will be provided with a video on brain dissection that will be used primarily for the laboratory on Feb. 15. This video must be returned before the practical exam.

Grades will be based on the following:

90% of your grade will be based on your score on the Laboratory Practical Exam. In this exam you will be asked to identify structures on whole brains, cross sections, dissected brains, and photographic images. Details on the format of the examination will be given during the lab session.

10% of your grade will be based on attendance and participation in identification of listed structures. This will also include participation and presentation of the Clinical Correlations. All members of the team assigned to a case study are expected to fully participate in presenting the case and in discussing the relevant neuroanatomical data needed to answer specific questions related to the case. You should be prepared to include pictures, cross sections, or gross brains as part of your presentation.

Details on what is covered in each lab is described in the Lab Manual.

Case Studies: Groups will be given a case study of a neurological disorder/trauma. Questions will follow the case which the group is expected to answer using whatever anatomical material or images they need. A computer and monitor will be available if students want to make up a short (3-4 slides) Powerpoint presentation. In addition, an overhead style projector will be available for demonstrating site of lesion, blood vessel involvement, etc. on gross brain/spinal cord material to the group. These sessions will be held on Feb. 1 and Feb. 8, 2017.

Jan. 11, 2017

Room 1024 Graves Hall Video – Dural sinuses, brain *in situ* ~ 45 minutes

Major Subdivisions of CNS

Venous Sinuses and Dural Folds

Jan. 18, 2017- 285 HAMILTON HALL:

Cranial Nerves – Origin on the brainstem

Arterial Supply of Brain

Meninges, Dural Folds, and Venous sinuses

Jan.25, 2017 - 285 HAMILTON HALL:

Gross anatomy of spinal cord (cadaver)

Major landmarks on medulla, pons, midbrain on gross brain and cross sections

Feb. 1, 2017 - 285 HAMILTON HALL:

Case Studies – Spinal cord, cranial Nerve and medullary involvement
Gross anatomy of the Diencephalon, and Forebrain including cerebral cortex and subcortical nuclei

Feb. 8, 2017 - 285 HAMILTON HALL:

Case Studies – Pons and Midbrain Involvement
Sagittal View Brain
Cross Sections/Atlas Images of diencephalon and forebrain

Feb. 15, 2017 - 285 HAMILTON HALL:

Continue - Cross Sections/Atlas Images of diencephalon and forebrain.
Dissection of specific region of brain selected by group. A copy of the brain video will be provided to guide you in this dissection. The video will need to be returned at the end of this lab session.

**Feb. 22 , 2017- 285 HAMILTON HALL:
REVIEW**

**March 1, 2017 – 285 Hamilton Hall
LAB PRACTICAL EXAM**

NeuroSc 7050
Neurobiology of Disease

3 semester credits

Class schedule:

Class meets 2 times/week (Tuesday 9:00-9:55 am and Thursday 9:00-10:55 am)

1st meeting (Thursday): 2 lectures

2nd meeting (Tuesday): discussion of assigned paper

Course Director:

Dr. Chien-liang Glenn Lin

Phone: 688-5433

Office: 4130 Graves Hall

E-mail: lin.492@osu.edu

Dr. Andrej Rotter

Phone: 292-7747

Office: 5142 Graves Hall

E-mail: rotter.1@osu.edu

Course description:

Neurobiology of Disease will explore the basis of major disease affecting the nervous system. Experts from throughout the university will provide state of the art overviews on the clinical, neuropathological, physiological and molecular features of diseases. Lecturers will also discuss key areas that hold promise for future research, including the development of rational therapies. Diseases to be discussed will include: neurodegenerative diseases, neurodevelopmental disorders, neurotrauma, brain tumors, seizure disorder, and multiple sclerosis. There will be a paper discussion following the lectures for each subject. Students will be required to write a 5-page research proposal and the proposals will be discussed on the final week of this course.

Grading:

The grade will be based on a research proposal, participation in paper discussion and class attendance.

Research Proposal 40 points

Paper discussion 40 points

Class attendance 20 points

<u>Grade</u>	<u>Total points</u>
A	90-100
B	80-89
C	70-79
D	60-69
E	<60

Schedule:

Week 1: Alzheimer's disease I

Lecture 1: Clinical and neuropathological features of Alzheimer's disease

Lecture 2: Molecular mechanisms and therapeutic approaches of Alzheimer's disease

Paper discussion

Week 2: Alzheimer's disease II

Lecture 1: Molecular mechanisms and therapeutic approaches of Alzheimer's disease

Lecture 2: Molecular mechanisms and therapeutic approaches of Alzheimer's disease

Paper discussion

Week 3: Motor neuron diseases

Lecture 1: Clinical and neuropathological features of ALS and SMA

Lecture 2: Molecular mechanisms and therapeutic approaches of SMA and ALS

Paper discussion

Week 4: Expanded repeat diseases

Lecture 1: Clinical and neuropathological features of Huntington's disease

Lecture 2: Molecular mechanisms and therapeutic approaches of expanded repeat diseases

Paper discussion

Week 5: Seizure disorder

Lecture 1: Clinical and neuropathological features of epilepsy

Lecture 2: Molecular mechanisms and therapeutic approaches of epilepsy

Paper discussion

Week 6: Neurotrauma

Lecture 1: Clinical and neuropathological features of brain and spinal cord trauma

Lecture 2: Molecular features and therapeutic approaches of spinal cord trauma

Paper discussion

Week 7: Parkinson's disease

Lecture 1: Clinical and neuropathological features of Parkinson's disease

Lecture 2: Molecular mechanisms and therapeutic approaches of Parkinson's disease

Paper discussion

Week 8: Neurodevelopmental disorders

Lecture 1: Clinical and neuropathological features of autism

Lecture 2: Molecular mechanisms and therapeutic approaches of autism

Paper discussion

Week 9: Brain tumors

Lecture 1: Clinical and neuropathological features of brain tumors

Lecture 2: Molecular mechanisms and therapeutic approaches of brain tumors

Paper discussion

Week 10: no class, spring break**Week 11: Multiple sclerosis**

Lecture 1: Clinical and neuropathological features of multiple sclerosis

Lecture 2: Molecular mechanisms and therapeutic approaches of multiple sclerosis

Paper discussion

Week 12: Stroke

Lecture 1: Clinical and neuropathological features of stroke

Lecture 2: Molecular mechanisms and therapeutic approaches of stroke

Paper discussion

Week 13: Mental disorders

Lecture 1: Clinical and neuropathological features of mental disorders

Lecture 2: Molecular mechanisms and therapeutic approaches of mental disorders

Paper discussion

Week 14: proposal discussion**Week 15: proposal discussion**

COURSES TO BE CREATED

NeuroSc 7530: Bioethics

1 semester hour

Class Schedule: 90 minute period meets once a week

COURSE DIRECTOR

Dr. Georgia Bishop
292-8363
3187W Graves Hall
bishop.9@osu.edu

OTHER FACULTY

Whereas, Dr. Bishop serves as course director and primary instructor, additional faculty will provide lectures in this course as noted on the class schedule below. They will provide contact information at the time of the lecture if there are questions.

COURSE DESCRIPTION:

The goal of the **Bioethics Course** is to discuss issues related to the ethical conduct related to research, medicine, undergraduate teaching, working with animals, working with minors. Case studies will be presented and discussed by the class.

ACADEMIC INTEGRITY (ACADEMIC MISCONDUCT)

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University's Code of Student Conduct, and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University's Code of Student Conduct and this syllabus may constitute "Academic Misconduct." The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the university, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's Code of Student Conduct is never considered an "excuse" for academic misconduct, so I recommend that you review the Code of Student Conduct and, specifically, the sections dealing with academic misconduct. If I suspect that a student has committed academic misconduct in this course, I am obligated by University Rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include suspension or dismissal from the University and a failing grade in this course. If you have any questions about the above policy, please contact me. Other sources of information on academic misconduct (integrity) include: COAM's web page (<<http://oaa.osu.edu/coam/home.html>>) "Eight Cardinal Rules of Academic Integrity" (<<http://www.northwestern.edu/uacc/8cards.html>>)

GRADING:

Readings will be assigned prior to each class. A short quiz worth 5 points will be given at the beginning of the lecture (~ 10 minutes) on the assigned readings with the exception of the first lecture. It is possible to earn a cumulative total of 70 points. A grade of S/U will be given based on cumulative score on the quizzes (90%), attendance (5%) and class participation (5%).

OFFICE HOURS: By appointment.

ACCOMODATIONS FOR DISABLED STUDENTS: Everything possible will be done to make every reasonable program or facility adjustment to assure success for each student.

SCHEDULE

Week 1: Research and research misconduct

Week 2: OSHA regulations

Week 3: Ethical issues involving human subjects; IRB

Week 4: Ethical issues involving animal subjects; IACUC

Week 5: Ethics in Industry

Week 6: Applied ethics – examples and discussion

Week 7: Applied ethics – examples and discussion

Week 8: Authorship and publication issues

Week 9: Data management and record keeping

Week 10: Confidentiality

Week 11: Ethics of Collaboration

Week 12: Conflict of interest

Week 13: FERPA/HIPPA regulations

Week 14: Working with minors

Week 15: Summary and Discussion

NeuroSc 7000.x

RESEARCH/EDUCATION TECHNIQUES

Course goals:

NeuroSc 7000.1: This will provide the necessary skills for students who have a goal to work in a basic science or clinical research laboratory either in academia or industry. They will be assigned to laboratories where they will become competent in various lab skills including but not limited to animal handling, PCR, immunohistochemistry, genetic screening, CRISPR, maintenance of lab notebooks, basic data analysis, microscopy, etc. This will be a letter graded course.

Students will be assigned to a mentor who will guide them through research techniques. Each mentor will set up a schedule to introduce students to the research topic of their laboratory, assign them to a project under the mentor's supervision or an individual of their designation (senior graduate student, postdoctoral fellow). Student will be taught techniques relevant to an individual who will continue on in a research environment. They will be taught to troubleshoot issues when an experiment fails.

The student cannot learn every biomedical technique. However, they will be taught basic skills on how to research a technique they are not familiar with, go over established protocols for a procedure, describe the process to their mentor. In this way, they will know how to approach new techniques as they move through their career.

The student will be given their own project during Spring semester which will serve as the basis for their Capstone project.

General Schedule:

Summer Semester: Introduction to the lab and on-going projects.

- Reading assignments related to research

- Participate in lab meetings

- Learn and carry out basic techniques used by the laboratory under supervision

Autumn Semester: More in depth appreciation of research and how it relates to other studies

- Develop critical thinking on research project

- Participate in lab meeting and give reports

- Begin to establish independence in carrying out projects

- Assist in preparation of presentations/give presentation at local venues

- Participate in preparation of manuscripts from members of the lab.

Spring Semester: Design their own project with input from the mentor

- Carry out the project

- Participate in lab meetings and give reports

- Establish independence in carrying out and trouble-shooting project

- Present data at local or national meeting

- If possible, prepare their own manuscript for publication with guidance

Summer Semester: Complete Capstone Project by writing a manuscript with introduction to the research topic, methods, results, and discussion.

NeuroSc 7000.2: Education Techniques. Students intent on a career in an education setting (e.g., high school science, neuroscience courses at community or small liberal arts colleges) would be paired with a faculty member engaged in didactic teaching at the undergraduate and/or graduate level. These students will be assigned to a mentor with a primary focus in education where they will become competent in developing courses, giving lectures, grading exams, counseling students, etc. These will be a letter graded course.

Students will be assigned to a mentor with primary teaching responsibilities.

Summer Semester: Work with mentor on preparing syllabi, setting up Carmen websites, preparing lecture material

Autumn Semester: Participate in the course(s) taught by mentor by preparing and giving their own lectures
Set up review sessions or be available for student consultation
Assist in setting up, administering, and grading exams.
Begin to develop a course of their own
Attend UCAT workshops on course development

Spring Semester: Take on more responsibility for the established course by giving more lectures, more student consultation, setting up Carmen site
Attend advanced UCAT workshops or take an elective in course development (see above)
Create a syllabus and lecture material for their own course that is reviewed by their mentor.

Summer Semester: Complete Capstone Project by completing development of a course, including lecture material, exams, evaluation strategies, setting up course objectives and learning goals.

NeuroSC 7600.X CAPSTONE PROJECT

NeuroSc 7600.1 (Research Track)

Course Description: This course is designed to provide a platform where students will demonstrate what they have learned from working in a research laboratory. It will be organized into three 4 week sessions. In the first session of the Summer Semester, students will design their own research projects and present them to a panel of their peers and faculty members in the program. This includes identifying an independent research project, presenting the rationale for carrying out the project including background (review of the literature), techniques to be used, and statistical technique to be applied to determine if results are significant. In addition to presenting their own project, students are expected to provide objective feedback to others in the course regarding their project. In the second Summer Session, students will give a report on the status of their project. They also will be expected to prepare a poster for presentation at a session that will include presentations from all students completing the Applied Master's in Neuroscience – Research Track. In the final session, they will prepare for their Master's Defense.

Course Goal: The Capstone course should allow the student to demonstrate basic skills of a research technician in the field of Neuroscience. This course will provide the students with an opportunity to demonstrate their knowledge and ability to design and carry out a research project.

Schedule:

The course will be divided into two 4 week sessions. The final exam will be carried out in the third 4 week session to meet Graduate School Deadlines for graduation summer term. Students will be divided into working subgroups to support each other and to provide feedback.

Session 1:

Week 1: Identify research question to be addressed. Include background leading to study and its significance. Describe techniques to be used.

Week 2: Discussion of statistical tests to be applied to obtain significance. For example, how many animals are needed, how many repetitions, etc.

Week 3: Describe potential problems and how they will be addressed.

Week 4: Discuss potential interpretation of data.

Session 2:

Week 1: Preliminary results from experiments carried out.

Week 2: Draft of poster presentation summarizing project

Week 3: Preparation of poster presentation summarizing project.

Week4: Poster presentation to peers and faculty. Prepare peer evaluation of assigned presentation.

Session 3:

Weeks 1- 3: Finalize manuscript and schedule Master's Defense including presentation of project to Master's committee and oral exam in accordance with graduate school schedule for graduation during summer semester.

NeuroSc 7600.2 (Education Track)

Course Description:

In this course students will demonstrate how the knowledge and skills learned throughout the semester is applicable to development of an original course at the graduate or undergraduate level. It will be organized into three 4 week sessions. In the first session, students in the education track will prepare a sample class that covers 3 weeks of their curriculum. The students should demonstrate competency in understanding educational theory by their ability to define learning goals and objectives and mechanisms for assessing these goals. Material developed for the course should reflect defined learning goals and objectives. Students will prepare a syllabus and lecture material that will be reviewed by the mentor and the student's Master's committee. The student should be able to incorporate suggestions to improve their teaching skills. In the second session, they will demonstrate the ability to present a selected lecture to a class at an appropriate level for the student audience. (i.e., undergraduate students, graduate students). Other students in the track will serve as the "class" for each other's presentations. In the final session, they will prepare for their Master's Defense.

Course Goal: The Capstone course should allow the student to demonstrate basic skills of an educator in the field of Neuroscience. This course will provide the students with an opportunity to demonstrate their knowledge and ability to design and deliver course material.

Schedule:

The course will be divided into two 4 week sessions. The final exam will be carried out in the third 4 week session to meet Graduate School Deadlines for graduation summer term. Students will be divided into working subgroups to support each other and to provide feedback. Each week during the semester, students will submit a draft of the course they are developing. Feedback will be provided by their peer group and the mentor. Specific aspects of the course will be discussed each week.

Session 1:

Week 1: Name of the course, level of instruction, need for this type of course, class size, prerequisites.

Week 2: Learning Objectives and goals and how these are to be assessed.

Week 3: Revision of course and/or learning objectives/goals based on peer and mentor feedback.

Week 4: Syllabus preparation including all components that need to be included (<https://ucat.osu.edu/bookshelf/teaching-topics/designing-a-course/what-did-you-put-in-your-syllabus/>)

Session 2:

Week 1: Example lecture in PPT format and example of assessment tool (i.e. examination over material in the sample course). Fill out form for submission of a course addressing all information needed.

Week 2: Presentation of sample lecture to peers. Prepare peer evaluation of assigned presentations.

Week 3: Presentation of sample lecture to peers. Prepare peer evaluation of assigned presentations.

Week4: Presentation of sample lecture to peers. Prepare peer evaluation of assigned presentations.

Session 3:

Weeks 1- 3: Finalize course and schedule Master's Defense including presentation of course development, lecture material, learning objectives and goals, and assessment tools to Master's committee and oral exam in accordance with graduate school schedule for graduation during summer semester.



THE OHIO STATE UNIVERSITY

Daniel M. Clinchot, MD
College of Medicine

Vice Dean for Education
Associate Vice President for Health Sciences Education

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Dan.Clinchot@osumc.edu

September 1, 2015

M. Scott Herness, Ph.D.
Interim Vice Provost for Graduate Studies and
Dean of the Graduate School
250 University Hall
230 North Oval Mall
Columbus, Ohio 43210-1366

Dear Scott:

The College of Medicine has reviewed and fully endorses the proposed Master's Degree in Applied Neuroscience. The degree was unanimously endorsed by the College Education Review Committee on June 30, 2015. The consensus of the committee was that the proposed program is well thought out and sequenced and that the degree will facilitate advancement within the field of neuroscience. The program is designed to provide a clear pathway for students interested in a career related to neuroscience after they complete their undergraduate degree. The specific and unique design of this program as a post-baccalaureate degree that has an integrated Career Development and Pathways in Neuroscience components will allow students within the program to firmly explore and solidify the next phase along their career path.

In summary the College of Medicine fully endorses the proposed Master's Degree in Applied Neuroscience. The proposed Master's Degree in Applied Neuroscience has been appropriately approved by the College of Medicine and has the full support and endorsement of the Dean. We feel strongly that it will be a highly sought after program.

Sincerely,

Daniel M. Clinchot, MD
Vice Dean for Education
College of Medicine

E. Christopher Ellison, MD
Interim Dean, College of Medicine



Neuroscience Graduate Program

John Oberdick, Ph.D.
4073 Graves Hall
333 W. 10th Ave.
Columbus, Ohio 43210

Phone: 614-292-8714
Fax: 614-688-8742

August 3, 2017

RE: NGP concurrence with new Masters in Applied Neuroscience

Dr. Georgia Bishop, PhD
Professor, Department of Neuroscience
The Ohio State University Wexner Medical Center

Dear Georgia;

Thank you for discussing with me your plans for a new graduate program entitled Masters in Applied Neuroscience. As Co-Director of the Neuroscience Graduate Program (NGP), one of the four PhD-granting Interdisciplinary Graduate Programs in the Life Sciences at Ohio State, I have a deep interest in graduate-level training. Your plan for a new masters program meets an important critical need that is currently lacking at Ohio State. There are many students for whom a five-year PhD training program is not an option, and your proposed program would allow such students to demonstrate a graduate-level understanding of neuroscience principles and research, and better prepare them for the growing availability of neuroscience-related career opportunities.

Do not hesitate to contact me should any further input be needed as you move forward with plans for your new program.

Sincerely,

A handwritten signature in blue ink, appearing to read "John Oberdick".

John Oberdick, Associate Professor of Neuroscience &
Co-Director, Neuroscience Graduate Program (NGP)
Ohio State University Wexner Medical Center

From: [Bishop, Georgia](#)
To: [Schlueter, Jennifer](#)
Cc: [Nelson, Randy](#); [DeVries, Courtney](#); [Herness, Scott](#); [Toft, Jill A.](#); [Clinchot, Dan](#)
Subject: Re: proposed Master's in Applied Neuroscience
Date: Tuesday, February 7, 2017 2:35:12 PM

Jennifer,

Thank you for the quick turn around. We tried to be very specific in defining the focus of the program. What is the committee really looking for? Some of the comments are a bit confusing. For example, the issue with the resume preparation. One goal of the program is to help students get jobs after completing the program. The intent of the Master's degree is to give them lab and teaching skills which qualifies them to work in a lab or in academia. However they also have to know how to prepare an excellent resume and to learn proper interview skills. My experience with undergrads, and even some grads is that these are skills that often are lacking or less than well-developed. With respect to the S/U grade, we have graduate courses in the Ph. D. Neuroscience Graduate Program with that grade designation such as journal clubs, seminars and independent studies. The 7520 course would fall into that category. Our major didactic courses all have letter grades. as would be expected. If necessary, we can change these courses to a letter grade. We would be happy to work with someone from UCAT. Just let me know if they are willing to help and who to contact. Are there any other specific comments we need to address? I do appreciate your help with this.

Georgia

From: Schlueter, Jennifer <schlueter.10@osu.edu>
Sent: Tuesday, February 7, 2017 10:17 AM
To: Bishop, Georgia
Cc: Toft, Jill A.; Herness, Scott
Subject: Re: proposed Master's in Applied Neuroscience

Dear Georgia:

At our Feb 6 meeting, the combined Grad School/CAA curriculum subcommittee met and reviewed your revised proposal for a tagged master's in neuroscience. We noted the many ways in which you had revised the proposal to address our concerns, and I want you to know how grateful we are for that work.

However, the committee is still unsatisfied with some of the fundamental aspects of the proposal, including the focus of the program and its learning goals and assessment strategies. We talked at length about how much time you have put in to this proposal, how certain we are that this will, ultimately, be a valuable tagged master's, and how much we want it to succeed. But, because the proposal must still be vetted at several levels above us, we are concerned that it will not move through without a more complete overhaul. And so we are returning it to you for another pass.

My sense is that you have been striving to address our feedback in contained ways when the issues that have been raised by the subcommittee will require a more global overhaul of the proposal, with especially careful reflection on—and articulation of—its goals and aims. For one small example: the narrative in the revised proposal has worked to minimize the job market prep aspects (such as learning goals focused on resume creation) but the syllabus for Neuroscience 7520 is still a course that, as it stands, appears to be entirely about resume creation and interview preparation (and also

graded S/U, which seems less than rigorous for a tagged master's). In this way, the verbiage about the program seems not to fit with its developing content.

I have reached out to Alan Kalish,³ director of the University Center for the Advancement of Teaching, to see if his office could be approached for assistance in curriculum and program development. This is something they do all the time for various departments and programs across campus. He—or Teresa Johnson.⁶⁷⁴—would be delighted to work one on one with you and your colleagues to think through the aspirations you have for this tagged master's, to guide you toward a strengthened vision of your program, and to help you get that vision onto paper. I think that seeking his assistance is the right next step in your revision process, and I am happy to make the initial introduction if you would like.

The subcommittee and I thank you for your work on this proposal, and look forward to reading a revision. Let me know if you have questions.

Best,
Jen

Jennifer Schlueter, PhD

Faculty Fellow for Curriculum, Graduate School
Associate Chair for Curriculum, Department of Theatre
Associate Professor | Lab Series Coordinator | Editor, Theatre/Practice
1108 Drake Center, 1849 Cannon Dr, Columbus, OH 43210
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From: "Schlueter, Jennifer" <schlueter.10@osu.edu>
Date: Tuesday, December 20, 2016 at 2:17 PM
To: "Bishop, Georgia" <bishop.9@osu.edu>
Cc: "Toft, Jill A." <toft.20@osu.edu>, "Herness, Scott" <herness.1@osu.edu>
Subject: proposed Master's in Applied Neuroscience

Dear Professor Bishop:

At our November meeting, the combined Grad School/CAA Curriculum Subcommittee (which I chair as Faculty Fellow) reviewed your revised request to approve the new Master of Applied Neuroscience.

The committee is grateful for your work to respond to the feedback from the Subcommittee last year on the first version of this proposal. On several points we still need further clarification and reframing, however.

1. **The looming issue is still the focus of the program.** As Catherine Montalto, last year's chair of

the GS/CAA Curriculum Subcommittee, wrote to you in item 2 of the attached notes here, “the focus, as currently written, appears to be on students who are unsuccessful in getting accepted to medical school, and the post-baccalaureate program is posited to somehow result in a strengthened re-application to professional school.... Yet, a tagged master’s degree is usually viewed as a terminal degree that produces content and skills that lead to employment.... The committee struggled with identifying that goal.” This revised proposal is still very soft in these respects. We note your statement, on page 1, that “potential career paths includ[e] medicine, research, academia, or industry.” But more specifics throughout the proposal—indeed, in its bedrock aims—are needed to clarify that the true intent of the program is that of a terminal degree focused on employment. This is to say: what are you training students to *do*? At present, it seems as though the program’s primary goal is still acceptance to medical school. To help this become clearer to the Subcommittees (and subsequent committees), specific job titles beyond “professions that are seeking applicants with some form of clinical and/or research experience...” are needed.

2. **Learning goals and assessment.** Learning Goals should express the core educational aims of the tagged Master’s program at a level appropriate for graduate student, which usually expects that students have added new scholarship to the area (a thesis) or demonstrated mastery by applying this new knowledge to a unique situation (a capstone project, exam, or case study). Currently, the Learning Goals as articulated continue to be a mix of aims that are appropriate to a Master’s program and that are merely skills that should be obtained along the way. For example: Learning Goal 5 (“Prepare a proper resume and demonstrate excellent interview skills”) is merely a skill to be obtained. It is not an appropriate Learning Goal for a Master’s program. And the fact that it continues to be included as such is part of what leads the Subcommittee to view this tagged Master’s as focused on acceptance to medical school and not, as framed, as truly terminal.

In some cases, your Learning Goals mix Goals with Assessment strategies. For example: “2. Develop lab/clinical skills best suited for their individual goals as demonstrated by positive evaluations from their rotation mentors” combines an assessment strategy (positive evaluations) with the goal itself (development of lab/clinical skills). In addition, the inclusion of a phrase like “best suited for their individual goals” suggests a lack of innate focus on clear outcomes in the program itself. You may consider reaching out to Thomas Mitchell.⁸¹⁵ or Amy Ferketich.¹, Graduate School Faculty Fellows focused on assessment for assistance in this process.

Once your Learning Goals are reframed, Assessment strategies will need revision. The Subcommittee wondered if you were considering piloting the program in some way to assess its efficacy?

The Subcommittee wants to encourage you and your colleagues to spend time revisiting, reviewing, and revising this material because clarifying Master’s-appropriate Learning Goals and Assessment strategies will, we believe, help you reframe this program (and therefore the proposal) to more effective ends than currently articulated.

The rest of the concerns raised by the Subcommittee really spin out from these two larger concerns. They include:

1. **Neuroscience 6193.** This course will be repeated 3 times in the program for a total of 8-12 credits. We recognize your desire to keep the course flexible and emphasizing student interests and needs. However, this contributes to the sense that the overall tagged Master’s is unfocused. It



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August 18, 2016

Dr. Scott Herness, Interim Vice Provost and Dean
Graduate School
250D University Hall
230 N Oval Mall
Columbus, OH 43210

Dear Dr. Herness,

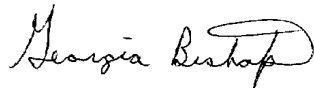
The Department of Neuroscience would like to resubmit our proposal for a Master of Applied Neuroscience to the Council on Academic Affairs Curriculum Subcommittee. We have responded to the feedback and requests provided by the committee following our initial submission as follows.

1. We have deleted all references to a Master of Science in the proposal and refer to it as a Master of Applied Neuroscience.
2. We have clarified the focus of the program and clearly indicate that it is not a post-baccalaureate bridge program. We have now indicated how the degree will produce content and skill that leads to employment or advanced training.
3. The academic content for the lab rotations has been more clearly defined.
4. We have included a description of how the program will prepare students for specific positions in industry or advanced degree programs.
5. We have included a syllabus in the appendix of the document for the proposed new courses.
6. We have contacted the Registrar's office and are in the process of developing a Degree Audit rather than using advising sheets. This will provide both the students and faculty access to information related to an individual's progress in the program. A draft is included in the Appendix.

7. We have described our special efforts to enroll and retain underrepresented groups in this proposal and will elaborate in the full proposal when it moves forward to the Ohio Department of Higher Education.
8. Learning goals have been revised as requested.

If you have any further questions, feel free to contact me. We thank you for your reconsideration of our proposal.

Sincerely yours,

A handwritten signature in cursive script that reads "Georgia Bishop". The signature is written in black ink and is positioned below the "Sincerely yours," text.

Georgia Bishop, Ph.D.
Professor and Vice Chair
Department of Neuroscience

bishop.9@osu.edu
614-292-8363

DRAFT Proposal for Master of Applied Neuroscience
To: Georgia Bishop and Courtney DeVries
cc: Daniel M. Clinchot

Good afternoon,

The Graduate School/Council on Academic Affairs Curriculum Subcommittee met on Friday, December 4, 2015 and reviewed the proposal for a Master of Applied Neuroscience.

The committee's feedback and requests are summarized below.

1. The committee assumes that the proposed program is a tagged master's degree, specifically a Master of Applied Neuroscience, but this should be clearly stated in the proposal. The last page of the proposal refers to a "Master of Science in Applied Neuroscience" in the "Assessment of Goals" section. If indeed the program is a tagged master's degree, the reference to a "Master of Science in Applied Neuroscience" should be removed.
2. The committee expressed concern that the focus of the Master of Applied Neuroscience program is under developed and not clearly articulated. Further, the focus, as currently written, appears to be on students who are unsuccessful in getting accepted to medical school, and the post-baccalaureate program is posited to somehow result in a strengthened re-application to professional school (for example, the program includes "teaching strategies for raising scores on standardized exams"). Yet, a tagged master's degree is usually viewed as a terminal degree that produces content and skill that leads to employment. The degree's name, Applied Neuroscience, suggests that the focus of the degree is to acquire advanced knowledge in the content area of neuroscience and be able to apply that knowledge towards some applied goal. The committee struggled with identifying that goal. The preparation of application to another professional program through a Master's degree is in itself not an academic goal. At times the proposal seemed more of a post-baccalaureate bridge program than a graduate program. Please clearly articulate the academic content of and the expertise in neuroscience developed through completion of this academic program.
3. Elaborate on the academic content students are likely to develop through the lab rotations in the first and second semesters (total of 6-10 credit hours). The final semester of enrollment includes 2-credit hours of independent studies "with focus on exam/dossier/application" -- please elaborate on how the focus of this concluding experience is determined.
4. Additionally, describe the relationship between the content of the tagged master's degree program and specific positions in industry, allowing us to understand the "return" these students will receive to two more years of education, or the "value added" of this investment.
5. For each of the proposed new courses, please provide a course syllabus; at a minimum the one page OAA syllabus template should be developed for each new course.
6. Please provide an advising sheet clearly communicating program requirements.
7. When this proposal moves forward to the Ohio Department of Higher Education, the special efforts to enroll and retain underrepresented groups will need to be fully developed and the special efforts that will be taken by faculty associated with the tagged master in applied neuroscience degree will need to be described. The guidelines for the full proposal can be accessed at this link <http://regents.ohio.gov/rgp/pdfs/RACGS%20Guidelines%20Approved%20102403.pdf>

8. Please review the materials previously provided by Dean Herness to guide the development of learning goals and assessment that are measurable and appropriate to the level of instruction. The content in the learning goals, as currently written, appears to re-iterate the program focus, rather than outcomes for student learning. The expectation of a Master's degree is that a student has successfully demonstrated advanced knowledge in a specialized academic area. At the graduate level, the student should not only have successfully demonstrated the acquisition of new knowledge but additionally have added new scholarship to that area (a thesis) or been able to demonstrate mastery of this new knowledge by applying it to a new and unique situation (e.g. a capstone project). An assessment plan can clearly articulate these goals, i.e. what should the student be able to know or do by time s/he graduates?; where does the student acquire this knowledge?; how is the student expected to demonstrate competence/mastery of this knowledge?.

Please incorporate changes into a revised proposal and summarize these changes in a cover letter. Once this information is received, the committee will return to the review of the proposal.

Please let me know if you have additional questions.

Thank you.

Catherine Montalto

Chair

Graduate School/Council on Academic Affairs Curriculum Subcommittee

1. DESIGNATION OF NEW DEGREE PROGRAM: Tagged Master's in Applied Neuroscience

RATIONALE FOR NEED FOR THE NEW DEGREE PROGRAM

The goal of the proposed Master's in Applied Neuroscience is to provide students with a Master's level curriculum that will provide both the didactic course work as well as research and clinical experiences that will prepare students for advanced training in a career in the biomedical field. Students who graduate with a Bachelor's Degree in Neuroscience may go into several different fields. A recent survey by the Undergraduate Neuroscience Major at The Ohio State University (OSU) determined that graduates of the program, (<https://neurosciencemajor.osu.edu/careers-neuroscience>) found employment in several areas including, Pharmaceutical Sales, Laboratory Technician, Science Writer, Science Advocacy, Lab Animal Care Technician, Sales Engineer, Special Education Assistant, Health Educator/Community Health Workers, Public Policy and several other areas. In general these positions have salaries ranging from \$25,000 to \$44,000 per year. A few positions had higher salaries, such as advertising, promotions and marketing managers (\$124,850) however, these required additional training and or additional work experience.

Students who had obtained a master's level education in Neuroscience had additional career opportunities including Nurse Practitioner, Physician's Assistant, Genetic Counselor, Biostatistician, Speech-Language Pathologist, and Public Health. Although many of these positions required additional training, the typical entry-level education requirement was a Master's Degree in a relevant scientific field (e.g., Neuroscience). Salaries increased significantly in these fields (\$73,000 to \$104,000). Finally, many students majoring in neuroscience are interested in pursuing an advanced degree in medicine, dentistry, veterinary medicine, neuropsychology, social work, clinical psychology, and academia, with the goal of becoming a professional research scientist, practitioner, and/or college professor. A Bachelor's degree in neuroscience can provide students with an excellent background for these programs and many easily make the transition from undergraduate to professional school. These students would not be the target population for this Master's degree. However, for others, decisions on a career path are not as clear and they may be in a position of deciding which career path is best for them. Further, many programs have additional requirements, beyond academics, such as clinical or research experience. The proposed tagged Masters in Applied Neuroscience is designed to prepare students for careers that require a Master's degree as the basis for acceptance into their programs as well as for students who want to enhance their marketability for professions that are seeking applicants with some form of clinical and/or research experience as well as an advanced knowledge base in a relevant scientific area.

The major focus will be on having candidates take graduate level courses which already have been developed for students in the Ph.D. program in Neuroscience. However, in addition to course work, there are additional factors that will make a student a more competitive candidate for these programs or positions. A key factor that will enhance their marketability is research or clinical experience at a level beyond what they may have carried out as undergraduate students as described below under Curriculum. The intent is not to make this a post-baccalaureate program, but rather to make it a rigorous program involving courses, as well as lab or clinical rotations.

The Master's in Applied Neuroscience at OSU will have a core curriculum that is Neuroscience based. However, it also will have components that would specifically focus on potential career paths including medicine, research, academia, or industry. Depending on individual student interests, we will propose different rotations that they could enter to further help them decide the proper career choice. For example, a student that might be interested in graduate school in Neuroscience to further pursue a career in academia would be placed in a research lab. A student considering medical school or physician assistant school would be assigned to a Neurologist or Neurosurgeon for a shadowing experience.

2. DESCRIPTION OF THE PROPOSED CURRICULUM

The proposal is to make this a 4 semester program. A minimum of 30 semester credit hours is required. To be in good standing in the Graduate School, a student must maintain a graduate cumulative point-hour ratio (CPHR) of 3.0 or better in all graduate credit courses and must maintain reasonable progress toward Graduate School or graduate program requirements. All instructors have been approved by the

Neuroscience Graduate Program and have P status in the Graduate School. All of the following are core courses that all students in the program will take. No Specializations are intended to appear on the student transcript. The proposed sequence of core courses is as follows.

Summer Semester: (3 Credit Hours)

NeuroSc xxxx: Pathways in Neuroscience – 3 Credit Hours (See description below)

Autumn Semester (12 – 14 Credit Hours):

NeuroSc 7001 Foundations of Neuroscience I – 6 credit hours

NeuroSc 7100 – Current Readings in Neuroscience – 1 Credit hour

NeuroSc 7510 – Pathways in Neuroscience– 2 Credit Hours (See description below)

NeuroSc 6193 – Individual Studies in Neuroscience (e.g., lab rotations, shadowing) – 3-5 credit hours

Spring Semester (12 – 14 Credit Hours)

NeuroSc 7002 Foundations of Neuroscience II – 6 credit hours

NeuroSc 7200.01 Neuroanatomy Laboratory (half semester) - 1 Credit Hour

NeuroSc 7050 – Neurobiology of Disease – 3 Credit Hours

NeuroSc 7520–Career Development – 2 credit hours

NeuroSc 6193 – Individual Studies in Neuroscience (e.g., lab Rotations, shadowing) – 3-5 credit Hours

Summer Semester (7 credit hours):

NeuroSc 7530 - Bioethics – 1 credit hour (see description below)

NeuroSc 6193 – Individual Studies in Neuroscience with a focus on preparation of written and oral examination – 2 credit hours

NeuroSc 7890 – Seminar Topics in Neuroscience – 2 Credit Hours

This core curriculum (NeuroSc 7001, 7100, 7002, 7200.01, 7050, and 7890) is made up of well-established courses taken by students enrolled in the Neuroscience Graduate Program. These courses also are available to students in other graduate programs as well as undergraduate students in the Honor's Program. Finally, they are applicable for students seeking a graduate minor in Neuroscience. Thus, requiring them for students in the Master's of Applied Neuroscience underscores that this program is designed to provide a strong Neuroscience core curriculum as well as providing individualized career exploration opportunities.

In the NeuroSc 6193 course, lab rotation content will be designed by the student and their rotation mentor. As noted above, for students interested in an academic career, the goal is to have them demonstrate that they can design an experiment, carry it out, analyze data, present data to peers and faculty, and to produce a publication. They need to demonstrate that they have basic lab skills, are able to take direction, show attention to details and, most importantly, show critical thinking skills. Other students intent on a career in a clinical setting (e.g., medicine, clinical psychology, dentistry, nurse practitioner, physician assistant, etc.). For students interested in these careers, we would expect them to identify a clinical mentor (from a list of faculty willing to take on these students) and to work with him/her. This would not be a simple shadowing experience. The students would identify a specific area of interest or a subset of patients with a specific medical condition to research.

Mentor Evaluation: In addition to their letter grades in the core courses, students will receive a written evaluation from their rotation mentor at the end of each semester.

DESCRIPTION OF NEW COURSES TO BE DEVELOPED

Three new courses are to be developed. These include, Pathways in Neuroscience, Career Development, and Bioethics. Although students will have different career goals, they will all participate in

these courses as this is designed to provide students with the basic skills needed to succeed at the next level regardless of their chosen career pathway. A description of these new courses follows.

The intent of the **Pathways in Neuroscience** course is to have it serve as a gateway that would expose students to faculty from different biomedical disciplines including Ph.D.s whose primary focus is research, Medical Doctors, Physician Assistants, Allied Medical Professionals, and other health related professionals as well as representatives from different biomedical-related industries, and faculty from small colleges. The intent is to make this an interactive course where discussions of pros and cons and future projections of workforce need for each career are discussed. Students would have the opportunity to ask questions and explore their interests. This course would be taught during the first summer semester in which the student is enrolled. Many students come in with a fairly firm idea of specifically what they want to do. However, this course would allow them to be exposed to other potential paths in case they decide to move their careers in a different direction. This would be an S/U graded course. Grading will be based on attendance and participation. See syllabus in Appendix.

The goal of the **Career Development** course is to provide students with the necessary skills needed to pursue a specific career path. Although students will have different career goals, they will participate in all sessions as this is designed to provide them with the basic skills needed to succeed at the next level regardless of their chosen career pathway. Skills to be taught include, but are not limited to:

1. Development of the skills needed to prepare a resume/application for professional or graduate school. Students will develop their own resume which will be reviewed and critiqued by other students in the course.
2. Development of interviewing skills. Students will learn the art of having a successful interview through in-class sessions as well by participating in mock interviews. The mock interviews will be set up for the students and conducted by expert faculty in their chosen career track.
3. Development of strategies to improve test taking skills. Faculty skilled in the art of performing well on national standardized exams will provide insight on how different exams are designed and how students can develop strategies for studying and organizing material so that they improve their performance.
4. Development of excellent presentation skills by facilitating discussion/presentations of what they are doing during their individualized career rotations.

See syllabus in Appendix.

The goal of the **Bioethics Course** is to discuss issues related to:

- Research and Research Misconduct
- Ethical issues involving human and/or animal subjects
- HIPPA regulations
- Applied Medical Ethics
- IRB/IACUC regulations
- Authorship and publication issues
- Data management and record keeping
- Peer review; Confidentiality
- Issues of collaboration
- Conflict of interest

See syllabus in Appendix

3. FINAL EVALUATION OF STUDENTS - MASTER'S EXAMINATION

Committee: The Master's Examination Committee will be composed of at least two Graduate Faculty members including the student's advisor. The student's advisor may invite other graduate faculty members to participate as members of the committee. The advisor of each master's student will hold membership at the category P level in the Neuroscience Graduate Program. All members of the Master's Examination Committee will be present during the oral portion of the examination and will participate fully in questioning the student as well as in the discussion and decision on the result.

Examination: The final examination will consist of both written and oral components to evaluate students. For the written portion, students will be asked to write a substantial paper that is specifically related to their professional goals. They will submit a draft to the Master's Examination Committee which must be approved by all members. Once the draft is approved the students will write the formal document. For those interested in academia, industry, or research positions, the written portion of the examination will consist of a detailed report of research they carried out in their advisor's lab. This would include hypothesis development, background of the project, methods used to test the hypothesis, results and discussion of the findings. For those interested in clinical professions (medicine, occupational therapy, physical therapy, physician assistant, nurse practitioner, etc) the document would be based on presentation of a neurological disorder based on their clinical rotation that provides details on the background of a patient's diagnosis, treatments carried out by the physician, prognosis, and research being carried out on the disease/disorder. All HIPPA guidelines will be followed to ensure anonymity of the selected patients.

Evaluation: After submission, the full paper will be reviewed by members of the Master's Examination Committee. When it is approved, students will have 2 weeks to prepare for an oral defense of their paper. At the oral defense, the focus will be on the paper itself, but topics from any of the courses they have taken may be included. The advisor will serve as the chair of the oral defense. Upon completion of the oral examination the Examination Committee will determine if the student has adequately addressed all questions and vote to pass or not pass the student.

4. ADMINISTRATIVE ARRANGEMENTS FOR THE PROPOSED PROGRAM

The Department of Neuroscience within the College of Medicine will be the administrative unit that has primary responsibility for administering the program. The Director, co-director, and a committee of graduate faculty will have primary responsibility for developing a handbook that specifically defines the requirements and responsibilities of faculty and students in accordance with Graduate School Handbook. They also would be responsible for monitoring student progress. In addition to those duties specified in the Graduate School Handbook, the Neuroscience Master's Committee will develop and evaluate the curriculum, establish program policies, standards, and procedures, screen applicants for admission to the program and make final determinations on admission, approve programs of study (as to general program requirements) for students in the program, conduct reviews of students at the end of each semester, receive and act on petitions from graduate students, hear and respond to graduate student grievances, and conduct any other program business that may arise.

5. EVIDENCE OF THE NEED FOR THE PROGRAM

Whereas several Ohio Universities offer Ph.D. degrees in Neuroscience that are primarily focused on a career in research, there are few Master's degree programs. Two of note are

Kent State University offers a Master's of Science in Neuroscience. Although it is defined as a Master's degree, preference is given to students applying for the Ph.D. Program. The description suggests that the Master's degree is given as a terminal degree for students that complete the core course work and who also have some research experience but for whatever reason choose to end their graduate training at that point.

Wright State University offers a Master's of Science in Physiology and Neuroscience. The purpose of the master's degree is to provide the student with a strong research-oriented background in one of several areas of physiology, biophysics, or neuroscience.

The Master's in Applied Neuroscience at OSU would have a core curriculum that is Neuroscience based. However, it also will have components that would specifically focus on individual student needs. Depending on individual student interests, we will propose different rotations that they could enter to further help them in achieving their future career goals, as described above.

In summary, this would be a unique program. It does not guarantee placement in a professional program but allows students to explore different possibilities in biomedical careers. Successful students would receive a Master's degree at the end of the program which is a tangible acknowledgement that they have

a certain level of expertise in a very important and rising biomedical field of study increasing their marketability and their likelihood of being admitted to a professional program, lab position, or industry related position. Students successfully completing the program would receive a letter of recommendation and a personal assessment.

6. PROSPECTIVE ADMISSION TO THE PROGRAM

Admission to the program would be limited to students with a baccalaureate from accredited institutions. Additional criteria would include demonstration of high promise based on their current professional activities. The minimum GPA for admission would be 3.0, although on average we would expect higher GPAs in the area of 3.4 – 4.0. GRE scores would be expected to be >70% in verbal and quantitative examinations. The proposed class size is initially 30 – 50 students. This likely would grow as the program becomes established.

7. SPECIAL EFFORTS TO ENROLL AND RETAIN UNDERREPRESENTED GROUPS

Individuals in underrepresented groups often have the greatest difficulty in enrolling in professional schools. The proposed major would critically evaluate applications from these individuals and make every effort to ensure they are included in the class. In addition, there are several colleges within Ohio (e.g., Central State University, Wilberforce) that are Historically Black Colleges and these would be the targets of selective mailings and visitations at career days to discuss the degree and encourage qualified students to apply.

8. AVAILABILITY AND ADEQUACY OF THE FACULTY AND FACILITIES AVAILABLE FOR THE NEW DEGREE PROGRAM.

No new facilities are required. We would need to recruit existing clinical faculty that are willing to serve as mentors to the students and to allow them to rotate with them in the clinics. Research faculty will be those with graduate status in the Neuroscience Graduate Program. Clinical faculty will be those with M or P graduate status. They will have TIUs in Departments such as Neurology, Neurosurgery, Psychiatry, Neuroradiology, Neuropathology, Anesthesia, Oral Biology, Orthodontics, University Laboratory Animal Resources (ULAR), Veterinary Biosciences, Veterinary Clinical Sciences, or Veterinary Preventive Medicine. Individual faculty will be identified based on the needs of the program each year.

9. NEED FOR ADDITIONAL FACILITIES AND STAFF AND THE PLANS TO MEET THIS NEED.

The program would need Administrative Associate assistance to support the operational aspects of the program. This individual would be a staff member in the Department of Neuroscience. In addition, we will need to support 4-5 Teaching Assistants. As the program grows, we may need to hire part-time lecturers.

10. PROJECTED ADDITIONAL COSTS ASSOCIATED WITH THE PROGRAM AND EVIDENCE OF INSTITUTIONAL COMMITMENT AND CAPACITY TO MEET THESE COSTS.

No additional costs are anticipated at this time. Attached is a letter of support and commitment from the Dean for Medical Education in the College of Medicine.

APPENDIX 1

LEARNING GOALS

Upon completion of the Master's of Applied Neuroscience, students should:

1. Demonstrate an advanced knowledge base in the field of Neuroscience including cell and molecular neuroscience, neuroanatomy, neurophysiology, behavioral science, and translational neuroscience based on grades obtained in the core courses.
2. Develop lab/clinical skills that are best suited for their individual goals as demonstrated by positive evaluations from their rotation mentors.
3. Develop presentation skills to demonstrate their ability to communicate their research/clinical experience to their peers and to faculty in the program. The ultimate goal is to successfully defend their written document at the time of their Master's examination.
4. Achieve a Master's Degree which will allow them to be more competitive for a positions in academia, medical schools, graduate schools, dental schools, veterinary schools, or industry.
5. Prepare a proper resume and demonstrate excellent interview skills by receiving a passing score in the Career Development Course.

Assessment of goals will be accomplished as follows.

1. Based on the written and oral portion of their final examination, the students should be able to convey to their Master's Examination Committee their neuroscience knowledge base. The written portion also allows them to convey to the Committee what they have accomplished during their rotations in a clear, concise and professional format. The Committee will determine if this goal is met following the oral portion of their examination.
2. Students will demonstrate competency in the broad discipline of neuroscience based on grades obtained in the core curriculum which covers each of these topics.
3. We will track students to identify what positions they take after successfully completing the Master's of Applied Neuroscience.
4. Resume preparation and interview skills will be evaluated in the Pathways in Neuroscience and Career Development courses that all students will be required to complete. Written feedback will be presented to the students on both their resumes and interview skills. They will not be given credit for the course until faculty determine these skills are achieved.
5. If students maintain a minimum 3.0 GPA in their courses and pass their oral and written examination, they will be awarded a Master's of Applied Neuroscience degree. We will track their success in being accepted into various professional programs. This will be essential for evaluating the effectiveness of the program.
6. Student success rates in being accepted into their chosen career path will be calculated and used as a measure to improve the career focused aspects of the program.
7. Periodically, alumni survey will be sent to graduates of the program requesting information on their current positions.

Appendix 2

NEUROSC 7510: Pathways in Neuroscience

2 semester hours

Class Schedule: 90 minute period meets once a week

COURSE DIRECTOR

Dr. Georgia Bishop
292-8363
3187W Graves Hall
bishop.9@osu.edu

OTHER FACULTY

Whereas, Dr. Bishop serves as course director and primary instructor, additional faculty will provide lectures in this course as noted on the class schedule below. They will provide contact information at the time of the lecture if there are questions.

WEBSITE: <http://carmen.osu.edu>

ACADEMIC INTEGRITY (ACADEMIC MISCONDUCT)

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University's Code of Student Conduct, and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University's Code of Student Conduct and this syllabus may constitute "Academic Misconduct." The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the university, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's Code of Student Conduct is never considered an "excuse" for academic misconduct, so I recommend that you review the Code of Student Conduct and, specifically, the sections dealing with academic misconduct. If I suspect that a student has committed academic misconduct in this course, I am obligated by University Rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include suspension or dismissal from the University and a failing grade in this course. If you have any questions about the above policy, please contact me. Other sources of information on academic misconduct (integrity) include: COAM's web page (<<http://oaa.osu.edu/coam/home.html>>) "Eight Cardinal Rules of Academic Integrity" (<<http://www.northwestern.edu/uacc/8cards.html>>)

GRADING:

A grade of S/U will be given based on attendance and class participation.

OFFICE HOURS: By appointment.

ACCOMODATIONS FOR DISABLED STUDENTS: Everything possible will be done to make every reasonable program or facility adjustment to assure success for each student.

COURSE DESCRIPTION:

The intent of the Pathways in Neuroscience course is to have it serve as a gateway that would expose students to faculty from different biomedical disciplines including Ph.D.s whose primary focus is research, Medical Doctors, Physician Assistants, Allied Medical Professionals, and other health related professionals as well as representatives from different biomedical-related industries, and faculty from small colleges. The intent is to make this an interactive course where discussions of pros and cons and future projections of workforce need for each career are discussed. Students would have the opportunity to ask questions and explore their interests. This course would be taught during the first summer semester in which the student is enrolled.

Week 1: Introduction and Overview of course

Week 2: Ph. D. in Neuroscience - Research

Week 3: Ph. D. in Neuroscience - Research

Week 4: M.D. - Clinical

Week 5: M. D. - Clinical

Week 6: Physician Assistant/Nurse Practitioner

Week 7: Physical Therapist/Occupational Therapist

Week 8: Batelle (industry)

Week 9: Industry (e.g., pharmaceutical, biotechnology)

Week 10: Industry (e.g., pharmaceutical, biotechnology)

Week 11: Veterinarian/Dentist

Week 12: Faculty from small college

Week 13: Faculty from small college

Week 14: Dean for Admissions to Medical School

Week 15: Summary and Discussion

Syllabus
NeuroSc 7520: Career Development in Neuroscience

2 semester hours

Class Schedule: 90 minute period meets once a week

COURSE DIRECTOR

Dr. Georgia Bishop
292-8363
3187W Graves Hall
bishop.9@osu.edu

OTHER FACULTY

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GRADING:

A grade of S/U will be given based on attendance and class participation.

OFFICE HOURS: By appointment.

ACCOMODATIONS FOR DISABLED STUDENTS: Everything possible will be done to make every reasonable program or facility adjustment to assure success for each student.

COURSE DESCRIPTION:

The goal of the **Career Development** course is to provide students with the necessary skills needed to pursue a specific career path. Although students will have different career goals, they will participate in all sessions as this is designed to provide them with the basic skills needed to succeed at the next level regardless of their chosen career pathway.

Week 1: Introduction and Overview of course

Week 2: Resume preparation.

Week 3: Resume preparation and in-class review

Week 4: Art of the Interview

Week 5: Art of the Interview

Week 6: In-class practice interview

Week 7: In-class practice interview

Week 8: In-class practice interview.

Week 9: Development of strategies to improve test taking skills.

Week 10: Development of strategies to improve test taking skills.

Week 11: Student Presentations

Week 12: Student Presentations

Week 13: Student Presentations

Week 14: Student Presentations

Week 15: Summary and Discussion

Syllabus
NeuroSc 7530: Bioethics

2 semester hours

Class Schedule: 90 minute period meets once a week

COURSE DIRECTOR

Dr. Georgia Bishop
292-8363
3187W Graves Hall
bishop.9@osu.edu

OTHER FACULTY

Whereas, Dr. Bishop serves as course director and primary instructor, additional faculty will provide lectures in this course as noted on the class schedule below. They will provide contact information at the time of the lecture if there are questions.

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GRADING:

A grade of S/U will be given based on attendance and class participation.

OFFICE HOURS: By appointment.

ACCOMODATIONS FOR DISABLED STUDENTS: Everything possible will be done to make every reasonable program or facility adjustment to assure success for each student.

COURSE DESCRIPTION:

The goal of the **Bioethics Course** is to discuss issues related to the ethical conduct related to research, medicine, undergraduate teaching, working with animals, working with minors. Case studies will be presented and discussed by the class.

- Week 1:** Research and research misconduct
- Week 2:** HIPPA regulations
- Week 3:** Ethical issues involving human subjects; IRB
- Week 4:** Ethical issues involving animal subjects; IACUC
- Week 5:** Ethics in Industry
- Week 6:** Applied ethics – examples and discussion
- Week 7:** Applied ethics – examples and discussion
- Week 8:** Authorship and publication issues
- Week 9:** Data management and record keeping
- Week 10:** Confidentiality
- Week 11:** Ethics of Collaboration
- Week 12:** Conflict of interest
- Week 13:** FERPA regulations
- Week 14:** Working with minors
- Week 15:** Summary and Discussion



Wexner
Medical
Center

**Department of
Neuroscience**

Randy J. Nelson, Ph.D.
Distinguished University Professor
Dr. John D. and E. Olive Brumbaugh
Chair in Brain Research and
Teaching
Department Of Neuroscience
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333 West 10th Avenue
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26 August 2015

Office of Academic Affairs
203 Bricker Hall
190 North Oval Mall
Columbus, OH 43210-1358

To whom it may concern,

I am writing this letter in strong support of the proposed Master's in Applied Neuroscience that will be offered by the Department of Neuroscience.

Existing Programs:

The Department does not have specific undergraduate or graduate major programs. We actively participate in the Undergraduate Major in Neuroscience in conjunction with the Department of Psychology. As noted on the website for this major "The Neuroscience Signature Program is a joint venture by the College of Arts and Sciences and the College of Medicine." Faculty in the Department play a major role in the curriculum for this major, including teaching two of the required core courses (NeuroSc 3000: Introduction to Neuroscience and NeuroSc 3050: Structure and Function of the Nervous System). In addition, to these core courses, electives developed by faculty in the Department of Neuroscience include: NeuroSc 3010: Introduction to Neurophysiology; NeuroSc. 22025: History of Neuroscience; NeuroSc 4050: Neurogenetics; NeuroSc 4100: Basic and Clinical Foundations of Neurological Disease; NeuroSc 4623: Biological Clocks and Behavior; NeuroSc 4640: Neuronal Signal Transduction; NeuroSc 4850: Contemporary Topics in Neuroscience; NeuroSc 5644: Behavioral Endocrinology; NeuroSc 5790H: Developmental Neuroscience. In addition students can sign up for internships and research hours with individual faculty in the Department.

In addition to undergraduate teaching, we are also an integral part of the interdisciplinary Neuroscience Graduate Program. Several courses have been developed and are taught by faculty in this program including NeuroSc7001: Fundamentals of Neuroscience I; NeuroSc 7002: Fundamentals of Neuroscience II; NeuroSc 7050: Neurobiology of Disease; NeuroSc 7100: Current Topics in Neuroscience; NeuroSc 7200.01 and 7200.02: Neuroscience Laboratory; NeuroSc 7500: Neuroimmunology. In

addition, students register for research for their dissertation (NeuroSc 8999) with faculty in the department.

Through the Neuroscience Graduate Program, students in other graduate programs may apply for a minor in Neuroscience. They are required to take 12 hours of graduate level Neuroscience courses offered by the Department of Neuroscience.

Finally, faculty also participate in teaching medical students. One member of the faculty currently serves as Block Leader for the Neurological Block. Some of the students in this block are in a combined MD/Ph.D. program.

Taken together, the Department of Neuroscience has extensive experience in didactic teaching and research training of students at the undergraduate, graduate, and professional levels through interactions with existing programs.

Review Process

The faculty review student and peer evaluations of instruction annually. These evaluations are included in the annual review of faculty and where needed, steps needed to improve the curriculum are discussed with the faculty member's mentoring committee and me. In addition, faculty teaching in courses review student performance at each examination, and adjust material as needed when areas of difficulty are identified. Student input, especially at the graduate level, is sought during their annual review process. Peer evaluation is an essential component of this evaluation and faculty ask members of their mentoring committee to evaluate their teaching at least annually. If problems are identified, then they work together, with the course directors, to correct them.

Based on our experience at multiple student levels, I strongly support this proposed Master's in Applied Neuroscience Degree. I believe that it will fill a needed niche to help students identify the correct career path after completing their undergraduate degrees. I approve the proposed program.

Sincerely,



Randy J. Nelson,
Distinguished University Professor
Brumbaugh Chair in Brain Research and Teaching
Professor and Chair, Department of Neuroscience

MASTER OF SCIENCE
APPLIED NEUROSCIENCE

AT LEAST ONE REQUIREMENT HAS NOT BEEN SATISFIED

NO MASTER OF SCIENCE REQUIREMENTS
APPLIED NEUROSCIENCE

- APPLIED NEUROSCIENCE CORE - COMPLETE 9 COURSES
FROM: NEUROSC 7001,7002,7050,7100,7200.01,7890

- INDIVIDUAL STUDIES I - COMPLETE 3-5 HOURS
FROM: NEUROSC 6193

- INDIVIDUAL STUDIES II - COMPLETE 3-5 HOURS
FROM: NEUROSC 6193

- INDIVIDUAL STUDIES III - COMPLETE 2 HOURS
FROM: NEUROSC 6193

***** END OF ANALYSIS *****